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Science, Politics, and Accounting: A View from the Potomac

Zoe-Vonna Palmrose
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I. INTRODUCTION

Over the past two years, while on leave from the University of Southern California and serving at the Securities and Exchange Commission (SEC), I have been fortunate to observe the advancement of a number of public policy initiatives related to the subject matter of accounting, the standard-setting process that determines generally accepted accounting principles (GAAP), and the communities of interests built around accounting and financial reporting, including auditing and the audit profession. This address will touch on some of these initiatives, to illustrate the profound nature of the changes afoot from the political front, which surely will help shape our research and teaching in the years to come.

However, this address also provided me with the opportunity to reflect on a fundamental question, which has been nagging as these public policy initiatives unfold: *Is accounting at a crossroads of its own conception?* Exploring this question is my overarching objective.

My intent is not to lecture readers on what to think. Rather, I would simply like to suggest some things to think about—"inconvenient truths" I call them. I acknowledge that this term borrows shamelessly from a former politician.[1] But this seems *apropos* since politics helps shape, sometimes subtly, our inconvenient truths. Besides, having helped energize the debate over global warming, perhaps shedding sunlight on some of our inconvenient accounting truths can do likewise for the debate over the nature and direction of our field.

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[1] That is, *An Inconvenient Truth*, Al Gore's Academy Award-winning 2006 film.

This article is based on the Presidential Scholar Address at the AAA's Annual Meeting in Anaheim, California, August 2008. I thank Gary Previts and the Executive Committee of the AAA for the special privilege of giving the 2008 Address. In addition, I thank Mike Brown for the discussions that helped form the substance of this address, and his suggestions as it unfolded. I also appreciate the helpful comments of Mike Gaynor, Roger Martin, Jeff Minton, Jim Ohlson, and especially Bill Kinney. Finally, I express a special thanks to the PartEcon team for including an accountant in the intellectual adventure.

Zoe-Vonna Palmrose served as Deputy Chief Accountant for Professional Practice in the Office of the Chief Accountant at the U.S. Securities and Exchange Commission from August 2006 through July 2008. The Commission, as a matter of policy, disclaims responsibility for any private publication or statement by any of its staff. The views expressed herein are those of Professor Palmrose and do not necessarily reflect the views of the Commission, the Commissioners, or any members of the Commission's staff.

Editor's note: This commentary, based on a lecture at the 2008 American Accounting Association Annual Meeting in Anaheim, CA, was invited by senior editor Steven Kachelmeier, consistent with the AAA Executive Committee's goal to promote broad dissemination of the AAA Presidential Research Lecture.

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To move the debate forward, I will suggest that we may need to draw on paradigms other than the traditional ones, like economics and psychology from the social sciences. Herein lies the science part of this address. In centuries past, the guiding lights of double-entry accounting were people well connected to the larger scientific communities of their times. So perhaps, once again, science can inspire, as we take up the challenge of reconsidering the foundations of accounting in the 21st century. In this spirit, I will conclude with some thoughts on the potential science-accounting connection, encompassing the natural sciences and complexity science. But, let's begin with the first of seven inconvenient accounting truths.

II. INCONVENIENT ACCOUNTING TRUTHS

GAAP is No Longer "Generally Accepted"

Following the Securities Act of 1933, Congress passed the Securities Exchange Act of 1934, which created the SEC, and gave it the authority to make financial reporting rules for publicly traded companies.[2] In turn, the SEC, with a number of other statutory assignments on its plate, decided to keep the power, but delegate the work to the private sector. An important benefit ensued from this approach in that U.S. GAAP applies both to companies that register and file with the SEC and to private companies that do not—one GAAP for all, regardless of size.

To assist the standard-setting process, the accounting profession formed the Committee on Accounting Procedure, or CAP.[3] The CAP consisted of volunteer accountants and auditors who studied and decided which accounting rules were "good," and transcribed them. The test of "good" rules was fairly simple: it was their "general acceptance." Not surprisingly, such rules became known as Generally Accepted Accounting Principles, or GAAP.[4] And with "general acceptance" as the goal, the CAP adopted "practicality" as its guide.[5]

Subsequently, the CAP was criticized for not promulgating a conceptual framework and permitting too much diversity in practice. The latter criticism partly came from the view that uniformity was needed for financial information to be comparable among companies. On the other hand, uniform standards, promulgated by the FASB, have resulted in the criticism that transactions can be structured to circumvent a standard's intent.

As to a conceptual framework, prior to the FASB, the Accounting Principles Board (APB) took up this challenge and produced two conceptual studies. The first was a broad study on the postulates of accounting (Moonitz 1961), to which the response was fairly subdued. The second outlined guidelines for doing the accounting (Sprouse and Moonitz 1962), which met with open hostility. Most contentious was the suggestion that the historical cost lessons from the 1929 stock market crash had outlived their usefulness and should be abandoned in favor of market value accounting (e.g., Previts and Merino 1998, 312–313).

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[2] Initially, the Federal Trade Commission administered the Securities Act of 1933; but, with the Exchange Act of 1934, the SEC assumed administration of both Acts. The 1933 Act applies to initial registration and issuance of securities. The Exchange Act of 1934 covers periodic reporting requirements for companies with publicly traded securities.

[3] The CAP was formed by the American Institute of Accountants (AIA). In June 1957, the AIA became the American Institute of Certified Public Accountants (AICPA). In 1959, a new group, the Accounting Principles Board (APB) was organized to replace the CAP. The APB consisted of a combination of volunteer member accountants and full-time staff, who worked under the auspices of the AICPA. Then, in 1972, the APB was replaced with today's Financial Accounting Standards Board (FASB).

[4] As a result of cooperation between the New York Stock Exchange (NYSE) and AIA to improve financial reporting practices after the 1929 stock market crash, the recommended form of the auditor's report was changed in early 1934 and first incorporated the concept of GAAP. Auditors were encouraged to opine that the financial statements "fairly present, in accordance with accepted principles of accounting consistently maintained by the company" (Cochrane 1950). "Generally" was added to GAAP in 1936 when the AIA published *Examination of Financial Statements by Independent Accountants*. At the time, "generally accepted" meant accounting for business transactions using principles extensively followed in practice (e.g., see comments by then SEC Chief Accountant Blough [1937]).

[5] This followed the guidance of the joint committee of the NYSE and the AIA that, by 1934, approved a rationale for financial reporting that stated: "Principles of accounting cannot be arrived at by pure reasoning, but must find their justification in practical utility" (Carey 1970, 6).

Further, over time the standard-setting approach shifted away from "general acceptance" and "practicality." In particular, with the formation of the FASB and its promulgation of a Conceptual Framework, accounting standards came to be crafted not so much by a broad referendum of practitioners (or general acceptance), emerging bottom up and reflecting "not perfect, but good-enough" solutions to the myriad of recognition, measurement, and disclosure issues that arise from practice. Rather, FASB standards are mostly promulgated top down by the consensus dicta of seven (recently reduced to five) full-time, independent board members.[6]

Unfortunately, there is widespread discontent and deep disenchantment with the current state of our accounting affairs.[7] Brewing for some time,[8] these forces helped provide the impetus for the SEC, in July 2007, to charter a Federal Advisory Committee on Improvements to Financial Reporting (CIFiR). In turn, CIFiR identified the central problem. Current accounting and financial reporting has become too difficult for users to understand, too difficult for preparers to apply, and too difficult for constituents to audit, analyze, and regulate (CIFiR 2008a, 18–19). In other words, it has all gotten too complex[9]—which brings me to the next inconvenient truth.

Once the Guardians of Business Order *from* Complexity, Accountants are Now Viewed as a *Source* of Complexity

How did this happen? Some of the complexity arises from the sheer volume of formal and informal U.S. accounting standards, regulations, and interpretations.[10] The volume only increases when adding International Financial Reporting Standards (IFRS) to the accounting standards needing to be mastered. In November 2007, the SEC dropped the requirement for those foreign private issuers that prepare their financial statements using IFRS as promulgated by the International Accounting Standards Board (IASB) to provide a reconciliation between IFRS and U.S. GAAP. Also, the AICPA recognized IFRS as acceptable for non-public companies. So, we now have two distinct sets of GAAP eligible for use in our U.S.

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[6] This is not to suggest that only a bottom-up approach should be used. Rather, standard setting needs a combination of top-down and bottom-up approaches (Brown and Palmrose 2005).

[7] While this address focuses on accounting, there is discontent with the current state of affairs in audit standard-setting as well (Palmrose 2008).

[8] For example, see Beresford (1999). Further, in 2004, as part of its response to growing concerns over complexity, the FASB commenced a project to develop a comprehensive integrated codification of all existing accounting literature. Also, see SEC (2005) and the FASB's response to this study, which identified the following as among the "powerful forces that generate complexity in the reporting system and impede improving financial reporting": conflicting perspectives and agendas of participants in the reporting process, resistance to change, an evolutionary approach to standard-setting, a continuing focus and emphasis on short-term earnings, gaps in the education and training of accountants, additional disclosure requests, continuing attempts to politicize standard-setting and regulation, and fear of being second-guessed by regulators, enforcers, and the trial bar (FASB 2006a, 7).

[9] CIFiR identified two broad categories of complexity—"avoidable" and "unavoidable"—and chose to focus on the former. According to CIFiR (2008a, 19), the latter arises from complex business activities and transactions including those crossing international boundaries and financial reporting regimes, all of which CIFiR considered beyond its scope. However, the causes categorized as avoidable and unavoidable are likely correlated, which suggests the need to consider both types (e.g., Schwarcz 2008).

[10] FASB (2008) describes the literature encompassed by GAAP and its hierarchy.

markets. Further, in August 2008, the SEC proposed for public comment a roadmap for use of IFRS by U.S. issuers that, if adopted, would permit a "small" group of U.S. companies to use IFRS for their 2009 annual reports.[11]

Still, for the moment, let's stay with U.S. GAAP because CIFiR (2008a) emphasized that the standards themselves represent another source of complexity. Specifically, the FASB writes individual standards that are difficult to understand and apply. Our Ph.D.s notwithstanding, we have all encountered this challenge in trying to teach, and our students have certainly encountered it in trying to learn GAAP. Moreover, this challenge occurs even when we focus on a selected subset of standards and their essential elements, setting aside all the details and nuances contained in each.

CIFiR (2008a) identified the mixed attribute model as an additional source of complexity. Under a mixed attribute model, the carrying amounts of some assets and liabilities are measured based on historical cost, others at lower of cost or market, and still others at fair value. While acknowledging the view that a complete transition to fair value would alleviate complexity resulting from the mixed attribute model, CIFiR nonetheless expressed concern that the expanded use of fair values would also increase complexity and cautioned against any such expansion until a number of practice issues are better understood and resolved.[12] Later I will return to the key topic of fair values.

For now, let's continue with the complexities from incomparability and inconsistency that arise in U.S. GAAP from sources other than the mixed attribute model. In this regard, standards also reflect the varying nature of demands placed on standard-setters, especially by preparers and auditors, for exceptions, industry-specific guidance, alternative accounting policies, competing models, scope exceptions, and bright lines. Likewise, piecemeal, duplicative, and outdated disclosure guidance create complexity.[13] Yet again, the issues are not straightforward because all of these can reflect actions originally taken by standard-setters to alleviate complexity. Indeed, such actions can be in response to demands for clarity and more certainty.

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[11] Meanwhile the FASB and IASB work along on their plans for converging the two sets of standards. Reducing complexity via convergence represents an important issue for audit and independence standards, as well. Considering convergence of these latter standards has been a focus of the Office of the Chief Accountant (Palmrose 2006). Unlike GAAP, there are two sets of generally accepted audit standards in the U.S. applicable for audits of business enterprises, because PCAOB audit standards apply to audits of public companies and standards promulgated by the AICPA's Auditing Standard Board (ASB) to private. Independence standards are similarly complicated with AICPA standards for audits of private companies (which currently serve as a model for independence-related requirements adopted by the various states), and then SEC and PCAOB independence rules for audits of public companies. Further, just as governmental and not-for-profits have their own accounting standards as set by the Governmental Accounting Standards Board (GASB), various federal and state agencies can have their own specific audit and independence requirements. In addition, there are international standard-setters promulgating standards for auditing (the International Auditing and Assurance Standards Board [IAASB]) and independence (the International Federation of Accountants Ethics Committee). Indeed, the larger audit firms use the IAASB's International Standards on Auditing (ISAs), rather than U.S. standards, as the starting point for their global audit methodologies. Discussions by members of the Department of the Treasury Advisory Committee on the Auditing Profession noted that this plethora and panoply of accounting, auditing, and independence rules may discourage smaller audit firms from, and disadvantage them in, competing for public company audits.

[12] Issues include: (1) the FASB completion of a measurement framework to systematically assign measurement attributes to different types of business activities and (2) the development and implementation by the SEC, FASB, and other regulators of a plan to strengthen the infrastructure that supports fair value reporting (CIFiR 2008a, 31).

[13] When I joined a Big 8 accounting firm, my first audit engagement involved a significant public company whose GAAP footnote disclosures fit on a single page in the company's annual report (using nice-sized font). Now most companies' GAAP footnotes go on for many pages. These extensive and detailed disclosures contributed to CIFiR (2008a) recommending the development of a disclosure framework and that an executive summary be added to company reports. The latter recommendation appears consistent with the signal to noise ratio problem in financial communications, recognized by the information technology (IT) community, whereby people generally need meaningful summaries of data to make useful decisions. In addition, such extensive disclosure requirements undermine the notion that standard-setters do not use disclosure as a substitute for problematic accounting standards or practices.

Preparers and auditors want comfort that they are making the "right" judgments in applying accounting standards to the various facts and circumstances occurring in practice. Essentially, this "search for safety"[14] reflects attempts to mitigate the risk of litigation, regulatory enforcement actions, and other significant consequences (such as through PCAOB inspections) from being second-guessed under our audit, legal, and regulatory systems (CIFiR 2008a, 41), which can challenge the results from the use of judgment.

All things considered, this widespread discontent with U.S. GAAP and all its complexity has led some to argue that we should just toss out our current system. For example, Don Nicolaisen, former Chief Accountant at the SEC, said recently: "I've often thought that the best solution may be simply to say as a regulator: All those old methods of accounting you grew up with, toss them all aside. Here's the new model" (Chasan 2008).

So, what is the new model being proposed? Well, IFRS. But herein lies another inconvenient truth.[15]

Against a Backdrop of Clarions Calling for Global Competitiveness and Convergence, We Are Ceding U.S. GAAP to the International Standard-Setters in the Interests of Principles, Simplification, and Judgment[16]

It is often said that IFRS is principles-based, and U.S. GAAP rules-based. While some consider the principles-versus-rules dichotomy a bit overdone, IFRS is less encumbered by detailed rules and contains little industry-specific guidance (CIFiR 2008a, 49). This helps IFRS appear more principles-based and less voluminous.

U.S. standard-setters acknowledge an erosion of principles in favor of rules, claiming this has occurred, in part, from the demand for specificity and the search for safety, which has been particularly characteristic of the U.S. environment. Pressures for exceptions have been another eroding force adding complexity to U.S. GAAP. Unfortunately, IFRS faces similar pressures. For example, political pressures present a concern for IFRS, including pressures to add exceptions to IFRS in certain countries (CIFiR 2008a, 51; CIFiR 2008b, 4–6).

Because IFRS and U.S. GAAP are at different stages of development, "newness" may contribute to making IFRS currently appear more principles-based. Certainly, IFRS has not yet built a robust infrastructure to resolve uncertainties that arise in practice around interpreting extant standards or to provide implementation guidance. This leads to a subtle source of complexity lurking in IFRS.

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[14] The phrase "search for safety" is adapted from Wildavsky (1988).

[15] This discussion does not explore the practical question of how actually to obtain one set of global high-quality accounting standards. To illustrate, converging U.S. GAAP and IFRS represents one model (and the FASB and IASB could continue to co-exist under this model), while U.S adoption of IFRS is another (and the FASB could cease to exist under this one). Thus, the discussion does not focus on the myriad of issues that arise if the SEC were to allow or require U.S. issuers to use IFRS. As with any important policy decision, diverse opinions exist and the SEC continues to seek input on options for proceeding with the use of IFRS by U.S. issuers, the feasibility of two GAAP's coexisting in the U.S. capital markets (at least for a time), the impact of optionality on the convergence process between U.S. GAAP and IFRS, the problems with jurisdictional adoptions of IFRS, and concerns with respect to the IASB governance structure. Further, the SEC recognizes the usefulness of feedback on the costs and benefits of allowing the use of IFRS in the U.S.; why issuers would or would not switch to IFRS; the mechanics of the transition for U.S. issuers; transition timing; education of market participants (including investors, preparers, auditors, and regulators); the regulatory, tax, contractual, and legal implications of a transition to IFRS; and the impact on private companies and even the CPA exam (White 2008a, 2008b).

[16] A political footnote can be added to this inconvenient truth in that cession is also being driven by the motives of a few key decision-makers to create their own legacies.

IFRS contains a number of alternative accounting policies for the same activity (CIFiR 2008, 51). Indeed, some quip that under IFRS, "anything goes." Nonetheless, taking a cue from IFRS and with previously expressed support from the SEC staff (e.g., SEC 2005), members of CIFiR encouraged the use of an objectives-based approach to the design and implementation of U.S. GAAP. This approach would allow a reasonable amount of diversity in practice (CIFiR 2008a, 74).[17]

But here is the rub. Whether we consider the prevalence of alternatives under principles-based standards or the diversity in practice under an objective-based approach, the spotlight shines on accounting judgments—by both management and auditors. Under these types of accounting regimes, auditors, in particular, would be required to make more judgments about judgments. Professor Kinney (2008, 3–4) made this point in testimony before the Department of the Treasury Advisory Committee on the Auditing Profession. He noted that with more principles-based standards and fair values, "the audit process may shift from 'given the rules, *is* management's number right?' to 'given the principles and alternative valuation models, *could* management's number be right?' " (emphasis in the original).

Of course, this is not at all what investors and other users have in mind, especially if the goalposts get so wide that the answer easily becomes "yes," which leads to another inconvenient truth.

Moving to More Judgment-Based GAAP Puts Significant Pressure on Auditors, Who are Already Struggling to Move Up in the Polls

Trustworthiness is one of the cornerstones for audits to have value (Kinney 2001). On this score, perceptions of auditors have shifted over time. For example, a 1979 "op-ed" piece in *Newsweek* included auditors as among our few remaining national institutions of trust.[18] Two decades later this trust was in jeopardy, as illustrated by a 1998 *BusinessWeek* exposé on earnings management entitled, "Who Can You Trust?" (see Barlett 1998; Byrnes et al. 1998; Melcher 1998). Distrust of auditors' motives, incentives, and judgments perhaps peaked with the accounting scandals that led to the Sarbanes-Oxley Act of 2002 (SOX). And now, even though evidence exists that confidence in auditing and financial reporting trends upward (e.g., Center for Audit Quality 2008), an important undercurrent of resentment against auditors lingers in the aftermath of SOX. I call it the "404 backlash."

In some circles, the sentiment exists that auditors have been enriched by SOX, particularly SOX Section 404, even though they are considered to have contributed to the problems that led to its enactment.[19] Simply put, this view has companies bearing the costs of increased regulation and audit firms receiving the benefits.[20] Moreover, in response to the costs of implementing Section 404, including using PCAOB Auditing Standard No. 2 (AS No. 2; PCAOB 2004), even regulators, who have long focused on audit quality and audit effectiveness, turned their attention to audit efficiency with respect to internal control over financial reporting (ICFR). For example, among other measures such as revising AS No. 2, the PCAOB agreed with the SEC to use the PCAOB inspection program to assess efficiency on ICFR audits (see PCAOB 2006; SEC 2006).

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[17] In addition, CIFiR (2008a, 66) asked the FASB to conduct post-adoption reviews of significant new standards. CIFiR (2008b, 5) thought these reviews should generally occur within one to two years of a standard's effective date and should ascertain the degree of diversity in practice. Then, if the FASB determined the diversity to be too broad or otherwise inappropriate, it would amend the standard or issue interpretative guidance.

[18] Actually, Price Waterhouse was used as the representative auditor, as follows: "Oh, we still have a few national institutions of trust left ... Lawrence Welk, Walter Cronkite, Roy Rogers, penicillin, Mary Tyler Moore, Price Waterhouse, and hot chicken soup. But everything is under scrutiny, including our own existence" (Bombeck 1979).

[19] Likewise, some skeptically view the larger audit firms' support for moving to IFRS as being mostly about new opportunities to generate revenues.

Let me stress that improving the implementation of 404 was essential.[21] Still, unfortunately, the cries of over-auditing now extend beyond ICFR to financial statement audits (thereby, encompassing both parts of the integrated audit).[22]

And this brings us to a critical point that needs to be recognized, namely: tension exists between over-auditing and acquiring requisite sufficient competent audit evidence, which comes to the forefront with accounting judgments. One manifestation of this tension is known as "second-guessing." While the perception of second-guessing pre-dates SOX and the formation of the PCAOB, it increased with the commencement of PCAOB inspections.

CIFiR (2008a) expressed sympathy with the widely held belief that there is too much second-guessing of accounting judgments. Indeed, "the perception that current practice by *auditors* and *regulators* in evaluating judgment does not provide an environment where such judgments may be generally respected" helped motivate the work of CIFiR (2008b, 63; emphasis added).[23]

To address the widespread concerns over lack of respect for reasoned accounting judgments, CIFiR (2008a) proposed that the SEC and PCAOB each adopt a framework for reviewing the exercise of judgment.[24] In the spirit of providing transparency into how *regulators* evaluate reasonableness, CIFiR recommended that the SEC articulate the components of a framework for accounting judgments as a policy statement.[25] Such a policy statement would identify the criteria for a critical and good-faith thought process, to communicate what the Commission and its staff use agency-wide—including in the Office of the Chief Accountant, the Division of Corporation Finance, and Enforcement—when evaluating the reasonableness of an accounting judgment. CIFiR suggested some components of a disciplined process, including the analysis of the transaction and review of the pertinent facts, identification of available alternatives, the robustness of analysis of the relevant literature, known diversity in practice, a well-reasoned explanation of the conclusions—all documented contemporaneously with the making of the accounting judgment, along with how the conclusions meet investors' information needs.[26]

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[20] Of course this simplistic characterization does not purport to represent a comprehensive examination of the costs versus benefits of SOX and Section 404, including those related to investor protection and improvements in financial reporting. Moreover, and somewhat ironically, the need for discipline over controls as embodied in Section 404 becomes especially critical under more judgment-based accounting regimes, such as IFRS.

[21] To do so, in May 2007, the SEC (2007) approved new interpretative guidance for management and, in July 2007, approved the PCAOB's new audit standard, AS No. 5 (PCAOB 2007), which replaced AS No. 2 (PCAOB 2004).

[22] To illustrate, in testimony before the Department of the Treasury Advisory Committee on the Auditing Profession, the Senior VP and Chief Auditor of NASDAQ said: "An important concern in the global marketplace is that U.S. listed companies are over audited enduring needless cost. Any measurement [of audit quality] should include determining how [audit] firms can control this increasingly costly problem" (O'Malley 2008, 3). Unlike the SEC, the PCAOB does not have any requirement to consider the costs and benefits of proposed rules or standards before adopting them; but, the Board says it does so. Even so, balancing the costs and benefits (and the efficiency/effectiveness) of PCAOB auditing standards and rules will likely continue to be an issue for regulators (Palmrose 2006).

[23] The proliferation of restatements has significantly contributed to this perception. Scholz (2008) provides a robust analysis of restatement trends from 1997–2006, including the contribution of non-exchange traded companies to these trends. Further, Plumlee and Yohn's (2008) analysis of restatements finds that, inconsistent with the notion that increased complexity has caused the rapid increase in the number of restatements, basic internal company errors unrelated to the accounting standards themselves represent the most frequent cause of restatements.

[24] Specifically, accounting judgments occur in the context of selecting accounting standards, implementing accounting standards, analogizing from existing standards where applicable accounting standards are lacking, financial statement presentation and disclosure, estimating the actual amount to record, and evaluating the sufficiency of evidence (CIFiR 2008a, 90–91).

[25] Similarly, CIFiR (2008a) recommended that the PCAOB issue a policy statement, consistent with the principles outlined, related to how the PCAOB, including in its inspection and enforcement activities, would evaluate the reasonableness of judgments made based on PCAOB auditing standards. In addition, the PCAOB policy statement should acknowledge that the PCAOB would look to the SEC's statement of policy in evaluating the appropriateness of accounting judgments as part of an auditor's compliance with PCAOB auditing standards.

It is noteworthy that CIFiR's discussion does not address what represents a reasonable result based on the facts and circumstances available at the time of the judgment. Indeed, there is no suggestion for guidance on determining what constitutes a reasonable range of acceptable judgments, *ex ante* (i.e., the width of the goalposts)—or assessing how much recorded amounts can differ from subsequent realizations *ex post*, while credibly maintaining the notion of a reasonable judgment. Essentially, CIFiR focused on process, not results (while pretty much supporting existing notions of materiality).

Still, one may think that such a judgment framework is eminently teachable, or perhaps even something already taught. While both may be so, they bring up another inconvenient truth, which I have postponed mentioning until now.

Accounting Education is Part of the Problem

CIFiR perceived accounting education as part of the complexity problem. CIFiR (2008a, 20) concluded: "Undergraduate and graduate education in accounting have traditionally emphasized the mechanics of double-entry bookkeeping, which favors the use of detailed rules rather than the full understanding of relevant principles."

Accounting educators might disagree with this assertion. And, while acknowledging both the heterogeneity in accounting education and the reasonableness of expecting accounting majors to be able to prepare journal entries to record transactions in accordance with GAAP, educators may especially disagree with the part about the mechanics of double-entry bookkeeping. On the other hand, representing yet a third perspective, perhaps we too much neglect the wonders of double-entry and the accounting equation, but now I am getting ahead of the story, as this comes later with the science.

The Department of the Treasury Advisory Committee on the Auditing Profession likewise took issue with accounting education. So, before concluding that CIFiR got it all wrong, considering whether accounting education has at least a marketing, if not a production, problem seems worthwhile. In doing so, perhaps we need to develop a view of the lifetime learning process for accountants and an articulation of the role of university education in that process. This seems important because—let's face it—whether teaching mechanics, rules, concepts, improvements, or whatnot, university education can only scratch the surface of GAAP. There is just too much GAAP and too few courses devoted to the preparation, use, auditing, and analysis of GAAP financials.

Further, it is worth asking: Are there enduring principles of accounting that we should be teaching, but currently are not? Are there overarching principles that serve the test of time and carry the day for making good accounting judgments? Two points should be made in this regard. First, accounting theory is the only course from my undergraduate and graduate days that I can recall being dropped from many, although not all, accounting curricula. Second, some of us were undergraduates when accounting did involve learning principles and then using analogical reasoning to answer practical accounting questions. But developing such skills has been long lost as GAAP evolved into becoming top-down and rules-based.

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[26] However, CIFiR (2008a, 93) cautioned that even though a judgment framework can enhance adherence to GAAP, it cannot be expected to correct inherent weaknesses in the GAAP standards to which it is applied.

The advisory committees did not consider how to get back to basics and reinstate a bottom-up approach to addressing accounting questions. Yet, this seems a prerequisite for making reasoned judgments, even though it represents a wholesale shift from the current state of accounting affairs. Essentially, we face a dilemma. How do we educate (or re-educate) for reasoning from principles, given that GAAP largely consists of so much detailed dicta; given the dynamics of our standard-setting system, where not only standards, but the concepts or principles reflected in them, often are in transition or flux; and given standard-setting reflects a political process more than an intellectual one?

The Conceptual Framework might be helpful for standard-setters as a way of articulating and rationalizing their decisions,[27] but the Conceptual Framework is not particularly helpful for students when considering how to understand GAAP and apply it to answer real-world questions. To do this, one has to know GAAP and how to conduct GAAP research. Accordingly, a number of programs have added a course on accounting research, which largely involves learning how to navigate GAAP to find answers to practice issues.

Let's not lose sight of the irony here. People who really know GAAP—what I call GAAP lawyers—if universities could turn them out, are very valuable. As an aside, you can tell GAAP lawyers—they talk numbers (FASB standard and paragraph numbers). In doing away with their nomenclature, the FASB codification has thrown a monkey wrench into the everyday language of GAAP lawyers. But, make no mistake, demand exists for people who really know all the glorious details and twists and turns for applying GAAP.

This brings us to another central problem not addressed by CIFiR. Namely, as GAAP has become more rules-based, the center of gravity for accounting has moved to compliance. Being an accountant steeped in GAAP is not a meaningful career path to CEO; the roles of GAAP accountants are not generally central for driving companies' operations and value-creation; and GAAP accountants no longer "own" the information landscape, as they have been disintermediated even here by the information technology (IT) professionals.

The educational implications of these developments are profound. The fundamental shift in the base of accounting to compliance yields another *very* inconvenient truth—accounting has become a second-class citizen in most business schools.

GAAP is No Longer the Language of Business

How has it all come to this? Consider the last several decades and another irony, that as GAAP has become more aligned with economics and reflected the thinking of financial economists, GAAP has developed communities of interests around compliance, while moving away from capturing the underlying economics of transactions and events.

CIFiR (2008a) was startlingly and revealingly candid on this score. CIFiR acknowledged general agreement that accounting *should* follow the economic substance and not just the form of a transaction or event and that many believe this fundamental principle

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[27] In October 2004, the FASB and IASB added a project to their agendas to develop an improved common conceptual framework that provides a sound foundation for developing future accounting standards that are principle-based and internally consistent. This long-term project involves eight phases, of which only four are currently active and, so far, preliminary views documents on these reveal some major differences from extant concepts.

should be extended to require *all* GAAP judgments reflect economic substance.[28] But, CIFiR also stressed, and here comes the troubling part, that reasonable people disagree on what economic substance is, and many would conclude that significant parts of current U.S. GAAP do not require and do not purport to measure economic substance.[29]

Similarly, CIFiR (2008a, 92) noted that "some would like financial reporting to be based on the 'high road'—a requirement to use the most preferable principle in all instances. Unfortunately, today a preparer is free to select from a variety of acceptable methods allowed by GAAP ... without any qualitative standard required in the selection process. In fact, a preferable method is required to be followed only when a change in accounting principle is made, a less preferable alternative is fully acceptable absent such a change." Moreover, "preferable" can be established simply by considering the accounting practices followed by others.

CIFiR (2008a, 92) was not optimistic about solving this economic substance problem anytime soon. Indeed, CIFiR believed that "adopting a requirement for economic substance, for taking the 'high road' would require a *revolutionary* change *not* achievable in the foreseeable future and probably not worthy of serious attention until a principles-based approach to GAAP is uniformly applied and 'rules' no longer govern GAAP" (CIFiR 2008b, 66–67; emphasis added).

Notwithstanding CIFiR's view,[30] standard-setters would likely argue that they are addressing the challenge to capture economic substance by moving toward fair values. For example, standard-setters believe, indeed some consider it self-evident: "Asset and liability measures that reflect current economic conditions and up-to-date expectations of the future will result in more useful information for making economic decisions, which is the objective of financial reporting. This is why standard-setters seem focused on fair value accounting" (Barth 2006, 271–272).

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[28] U.S. *auditing* standards (SAS No. 69, AICPA 1992) note that U.S. GAAP recognizes the importance of reporting transactions and events in accordance with their substance and states that the auditor should consider whether the substance of transactions or events differ materially from their form. Nonetheless, under U.S. GAAP, the objective of financial statements is fair presentation *in accordance with GAAP* (SAS No. 69); essentially, GAAP conditions the determination of fair presentation. This contrasts with the overriding requirement of IFRS for the financial statements to give a fair presentation (or true and fair view) (KPMG 2008, 6). Importantly, unlike IFRS, there is no general principle in U.S. *accounting* standards (GAAP) that transactions should be accounted for in accordance with their substance, rather than only their legal form (KPMG 2008, 11). And, even setting aside the low authoritative status of FASB Concept Statements in the GAAP hierarchy (FASB 2008), arguably, the qualitative characteristics of accounting information under U.S. GAAP, such as representational faithfulness, do not overcome this omission. (Further, see the subsequent footnote discussion of Rule 203.) A final point of interest is the SOX Section 906 certification requirement that the financial statements "fairly present"—which is not explicitly conditioned on GAAP. (I thank Bill Kinney for calling this point to my attention.) Section 906, which carries criminal penalties, requires chief executive officers and chief financial officers to certify each periodic report containing financial statements filed by an issuer with the SEC pursuant to sections 13(a) and 15(d) of the Securities Exchange Act of 1934 complies with the requirements of those sections and that the information contained in the periodic report fairly presents, in all material respects, the financial condition and results of operations of the issuer.

[29] Some may be thinking that this problem can be attacked using Rule 203 of the AICPA Code of Professional Conduct, which allows the auditor, under unusual circumstances, to render an unqualified opinion on financial statements that depart from GAAP, if it can be demonstrated that such a departure is necessary to make such financials not misleading. In other words, if complying with GAAP does not capture the underlying economics of the relevant transactions and events, management could depart from GAAP to do so, and auditors could still issue clean opinions. Setting aside other issues with using this mechanism to overcome fundamental problems with GAAP, the PCAOB *did not* adopt Rule 203 as an interim standard, so any Rule 203 override is inoperative on audits of public companies. Further, there is no provision in SEC regulations for issuers to depart from GAAP. Indeed, according to 4–01(a)(1) of S-X, financial statements filed with the Commission that are not prepared in accordance with GAAP will be presumed to be misleading or inaccurate, despite footnote or other disclosures, unless the Commission has otherwise provided. An open question exists whether the IFRS "true and fair" override would be in accordance with GAAP such that it will work with S-X.

[30] CIFiR (2008a, 40) also recommended that the SEC, FASB, academics, and professional organizations all undertake efforts to better educate students, investors, preparers, auditors, and regulators to consider the economic substance and business purpose of transactions in determining the appropriate accounting, rather than relying on mechanical compliance with rules.

The topic of fair values brings us to the last inconvenient truth.

Just Because It Can be Measured Does Not Mean It Should be Presented in the Financial Statements

Financial statement users are a heterogeneous lot, and not all of them find it self-evident that fair values meet the objectives of financial reporting. Rather than pleased, some users express dismay that sophisticated valuation models can determine amounts reported on the financial statements, including earnings. This dismay gets acute when it comes to fair values using models and unobservable inputs based on assumptions by management about market participants' assumptions. Further, some worry that fair value accounting runs the risk of producing less accurate, less relevant, and less auditable financial statements. And, some "fear it will lead to financial statements that are fundamentally less helpful in judging the operating performance of companies, and will likely encourage management and investors to think in shorter time frames than is really best" (Silvers 2007, 44).

Recent events have brought fair value accounting to the forefront as one of the public policy issues of greatest concern to both market participants and regulators. To help identify these concerns, in July 2008, the SEC held a roundtable on fair value accounting standards.[31]

There is an element of déjà vu here. Although mostly forgotten in the footnotes of history, in surveying the wreckage after the U.S. stock market crash in 1929 and questioning how it happened, most agreed that bad accounting practices had played a major role (Zeff 1972, 155–157).[32] One such practice involved marking up assets to more optimistic market values. But when market prices subsequently dropped, investors' hopes and dreams—built on margin and based on paper—evaporated into a reality of despair.

At the time, many agreed with the influential George O. May that accountants "fell from grace" when they "took to readjusting asset values to an extent never before attempted," believing that "a new order of things combined to recommend such a course." As George O. went on to observe, "the wiser policy is to admit the error and to determine not to be misled into committing it again" (May 1936, 310).[33] The newly formed SEC certainly agreed. For several decades, still mindful of the crash, the SEC prohibited companies from upwardly adjusting to market values and even from presenting supplementary information about the current values of their assets (Walker 1992; Zeff 1972).

Given this history, why are standard-setters reverting to fair value accounting as the ultimate solution to what ails GAAP? Have we lost sight of our principles or just lost them altogether? I am not sure, but in the main, it seems clear that we have lost touch with our accounting foundations somewhere along the way.

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[31] The roundtable focused on the usefulness of fair value accounting to investors, potential market behavior effects from fair value accounting, practical experience and potential challenges in applying fair value accounting standards, aspects of the current standards, if any, that can be improved, and experience with auditors providing assurance regarding fair value accounting.

[32] Bad practices encompassed poorly disclosed or undisclosed practices. For a discussion of a number of disclosure issues at the time, see Ripley's (1927) seminal book.

[33] George O. May also understood that accounting involves trade-offs—and he understood how to go about making them. For example, he chaired the Special Committee on Co-operation with Stock Exchanges, which, in 1932, persuasively argued for an income statement, rather than balance sheet, perspective in developing accounting conventions. The Committee stated: "It is probably fairly well recognized by intelligent investors today that the earning capacity is the fact of crucial importance in the valuation of an industrial enterprise, and that therefore the income account [statement] is far more important than the balance-sheet" (AIA undated pamphlet, 8).

Three years ago, a panel session at the AAA Annual Meeting in San Francisco helped engage academics in the debate over fair value accounting. At that session, to illustrate the foundational nature of the different perspectives at stake in this debate, I posed a simple question that students might consider at the start of their first accounting course or at the start of an introductory auditing class. The question was: Suppose you had the choice of preparing, using, or auditing financial statements based on,

(1) actual transactions,
(2) expected transactions, or
(3) hypothetical transactions.

Which seems to make the most sense? Which makes the least sense? Which would you choose?

Then, as now, I suspect students would most favor actual transactions and least favor hypothetical transactions. Although, some students, at least in auditing, might suggest substituting expected transactions for actual when necessary to avoid overstating assets, understating liabilities, and overstating earnings (recognizing the important tradition of such things as an allowance for doubtful accounts, lower of cost or market, and conservative accounting). Overlooked in fair value debates on liquid markets that dry up over night and such things as "level 3," accounting in the current credit crisis is also about problems recognizing and measuring "other than temporary impairments," which would also be necessary under lower of cost or market. However, prior fair value write-ups may be exacerbating the magnitude of current impairments. Still, this simple question juxtaposes intuition and common sense with the current direction of standard-setting, which embraces hypotheticals.

In pushing fair values, standard-setters are allowing recorded amounts to reflect a price that *would* be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date (FAS No. 157, para. 5 [FASB 2006b]), even though no such transaction has occurred and the company still holds the asset or is obligated for the liability.[34] As a result, in dynamic market settings, we find that as investors reflect on a company's earnings in deciding what next to bid or what to ask for a company's stock, they are increasingly provided with accounting information that includes the anticipated collective results of yet unmade decisions.

The Conceptual Framework proclaims GAAP's neutrality. But everyone knows that Norwalk, Connecticut is not in Switzerland—we know GAAP is not neutral—it has economic consequences. A conceptual framework that declares neutrality—let the chips fall where they may—not only fails to resonate, but also engenders its own discord and, as we have seen, reinforces the reality of accounting standard-setting as a political process.

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[34] I based this vignette on the FASB's own materials (e.g., see the "Summary" in SFAS No. 157 [FASB 2006b]). On the other hand, some contend fair value accounting does not involve hypothetical transactions. Rather, it simply incorporates estimates of the future for assets and liabilities (using recognition criteria) as defined by GAAP, which are conditioned on past transactions and events (Barth 2006). But again, I believe we can all agree that fair value attempts to capture, for example, what an asset would fetch if the company sold it at the balance sheet date. This is a hypothetical transaction because the company continues to hold the asset and has not sold it; indeed, management may have no plans to do so in the foreseeable future.

III. IS ACCOUNTING AT THE CROSSROADS OF ITS OWN CONCEPTION?

With these inconvenient truths before us, let's return to the original question: Is accounting at the crossroads of its own conception? I believe the answer is an unequivocal yes. So now the question becomes: What is the path forward?

To help us find it, I will draw on Lee Smolin's (2006) wonderful book, *The Trouble with Physics*, which diagnoses how scientific inquiry can lose its way, and provides constructive insights for regaining scientific progress. First, it seems essential to abandon any complacency and just admit that we do not know the basics in our field. Then, we need to make room for those who think deeply and carefully about foundational issues in accounting, and encourage work that does so in nontraditional ways. Finally, the results of foundational thinking should pervade our field, not only influencing accounting research, but influencing teaching and practice as well. This argument implies an important role for accounting theory, which carries the practical implication of restoring to our curriculum something that we have lost. The best, most enlightened accounting judgments and hope for improvements in GAAP come from people who understand how to think about accounting, and are willing to challenge the conventional wisdom.

To envision the path forward, let's briefly explore some of these points. First, we need to understand the basics. There is nothing more basic than debits, credits, and the accounting equation. Accountants take these so much for granted that educational reforms have debated not teaching debits and credits at all. In fact, I doubt that many accountants would put double-entry accounting on the short list of mankind's greatest inventions. Yet that is exactly what the "techno-thinkers" polled by John Brockman (1999) (literary agent to the digerati) did at the turn of this century. Indeed, they described double-entry accounting as "the DOS of money."

This powerful statement gets right to the foundational issues that elude us. For example, I cannot recall one article in a major accounting journal or one accounting textbook that explores the connection between accounting and money,[35] although we are living through a credit crisis that begs for understanding this connection. Others outside accounting are pursuing the money side, including the time-money connection; and, they draw on fields such as physics to do so (e.g., Bak et al. 1999). Perhaps the potential for physics to help address foundational issues in accounting is less outrageous than it may seem when considering that the theory and mathematics behind the Nobel Prize winning Black-Scholes option pricing formula was "adopted from the mathematics of the heat transfer differential equation of physics (and employed the then new tools of stochastic calculus)" (Bookstaber 2007, 9).[36]

Additional illustrations reinforce the notion of progress on fundamental questions in accounting by considering work in fields of science outside the traditional social sciences. For example, "complexity" has been a major theme threading through our inconvenient accounting truths. A relatively new science of complex adaptive systems has emerged, fueled by vast increases in computing power and the connectivity that has resulted therefrom. While complexity science cuts across scientific disciplines, attracting the attention, for example, of physicists, biologists, mathematicians, chemists, cosmologists, and economists (Kauffman 1995), accounting largely ignores this work. And, there is no evidence that CIFiR considered it at all.

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[35] However, see Brown and Palmrose (2005) for a discussion of this connection.

[36] Consistent with the discussion of the last inconvenient truth, this does not intend to suggest that such a formula should be used to measure and record stock option expense in the financial statements.

Yet, the basic accounting equation captures the binary simplifications of complexity sufficient for exchange to occur (Brown and Palmrose 2005). In this regard, its role is potentially profound. Kauffman (1995) reminds us that in highly complex spaces that are mathematically representable as multidimensional, when any one dimension is binary, order appears to emerge automatically. He goes on to invite us to imagine the origins of life itself as emergent order. Kurzweil (1999) tells us that DNA, the basis for the evolution of all life on earth, is nature's basic digital recordkeeping system. So, perhaps our econosphere and biosphere are interconnected in the deepest of ways through fundamental commonalities in recordkeeping.

Complexity science also helps us understand the nature of phase transitions, of which the current credit crisis is an example. Perhaps it can help us appreciate accounting's role, if any, in disruptive phase transitions in goods and services as well as financial markets. Complexity science could help us explore foundational issues related to transaction-based historical costs versus fair values, gaining insight into whether the latter perturbs and obscures the relative measures of important physical economic activities.

In exploring these foundational issues, we need to abandon the illusion of neutrality when it comes to accounting standards. We can take a lesson from physics, which had to abandon neutrality to explain the physical world when quantum mechanics revealed "that it is not possible to observe reality without changing it" (Zukav 1979, 30). GAAP has economic consequences and computational advances have given us the ability to assess them through consequential modeling (Pagels 1988). Such computational experimentation includes using agent-based models for explaining how an economy works. To illustrate, such models might help us understand the many different cycles in which economic activities occur and the implications of these various cycles for accounting recognition and measurement within the contours of quarterly and annual reporting. Yet, here again, accounting journals contain few articles using simulation methodology, and certainly none to date using consequential modeling to predict economic effects of accounting standards—before their adoption.[37]

In addition to modeling the economic consequences of accounting policies, accounting can play another role in agent-based consequential modeling. Accounting provides a way to measure the financial consequences of economic regulatory policies. To illustrate, with policies related to energy or global warming, it is possible to envision the importance of measuring the financial consequences experienced by classes of agents from changes in the rules by which they interact with one another. The discipline of double-entry accounting, based on a sound footing, can represent a core part of the architecture for this work.

In conclusion, much has changed since the efficient market paradigm dominated our field by essentially disenfranchising accounting with its espousing of disclosure as the silver bullet for our capital markets—"When in doubt, just disclose." Ironically, although essential elements of this paradigm have been challenged, and it no longer occupies the position of dominance it did when I was a graduate student, the discontent with accounting is greater now than ever. *And this time, we find ourselves at a crossroads of our own conception.*

Recognizing our tenuous position seems the first step. Importantly, in spite of all the recent developments on the political front, I predict science rather than politics has the most profound implications for accounting, and that science offers us the best hope for finding a path forward. This is good news for accounting academics, since we are not generally politicians, but we are scientists. Perhaps we just need to consider science more broadly than only the social sciences. I am delighted to be back to the job of doing so, in exploring the challenges facing our field.

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[37] Darley and Outkin (2007) provide an illustration of how an effective agent-based simulation can be used to consider the impact of regulation before enactment. In 1998, they conceived a model to help regulators predict the consequences of proposed new "decimalization" rules for our markets. Although ignored by regulators at the time, a decade later evidence points to its prescience.

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Nonfinancial Performance Measures as Coordination Devices

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ABSTRACT: We investigate how nonfinancial performance measures (NPMs) can be used to encourage cooperation across divisions. The implementation of a project often requires joint efforts by multiple divisions. However, privately informed division managers sometimes find it in their self-interest to forgo profitable joint projects or to underinvest in relationship-specific assets. By treating the implementation of a joint project (e.g., a major process improvement or new product development) as an NPM, we show that paying the division managers discrete bonuses tied to this NPM improves the efficiency of project implementation *and* upfront investments. We derive how the optimal implementation bonus trades off distortions in *ex post* implementation and *ex ante* investments. In a dynamic version of the base model with learning-by-doing, we show that conditional on a project being implemented early on, the implementation bonus in subsequent periods will be higher than if the earlier project had not been implemented.

Keywords: *nonfinancial performance measures; interdivisional cooperation; asymmetric information; investment incentives.*

I. INTRODUCTION

A key feature of multidivisional firms is that authority over operational decision making is delegated from top management to division managers. However, top management retains design rights associated with corporate strategy and the coordination of the individual divisions that may be required to achieve that corporate strategy (Milgrom and Roberts 1992; Williamson 1975). A claimed major advantage of the multidivisional versus centralized structure is its superiority in dealing with dispersed decision-relevant information. However, the need for top management to retain a coordinating role

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highlights a weakness of the multidivisional structure; externalities among the divisions invariably exist and may not be properly captured by the firm's divisional performance metrics. As a result, the divisions may not have the incentive to efficiently manage these interdivisional externalities, resulting in a coordination failure.[1] Our objective is to study how nonfinancial performance measures (NPMs) can be used to improve interdivisional coordination.

One way for the decentralized firm to overcome interdivisional externality problems is to evaluate each division manager on the basis of firm-wide performance. However, doing so has its own costs: it exposes division managers to extraneous compensation risk (Holmstrom and Tirole 1991; Anctil and Dutta 1999); it requires a significant amount of communication among the divisions and top management; and it dilutes managers' effort incentives as the signal-to-noise ratio of firm-wide performance with respect to any individual manager's actions is often negligible. In practice, these costs appear to be substantial, because, empirically, divisional income is the dominant driver of division managers' compensation.[2] Based on this empirical fact, and taking as given a decentralized firm structure, we develop a contracting model to analyze how a system of divisional financial performance evaluation can be augmented with NPMs so as to mitigate interdivisional externality problems. The model generates novel empirical predictions about the incentive weights associated with NPMs as a function of a variety of observable variables.

We model a firm with two divisions. Each division is run by a manager who exerts non-contractible "general purpose" effort that affects only his division's income. Each manager is privately informed as to his personal cost of that effort. This creates a need for divisional performance measurement. Second, interdivisional externalities arise in the form of a potentially profitable joint project that can be implemented only if the two divisions cooperate in doing so. This implementation decision cannot be contracted upon ahead of time; instead it must be negotiated among the managers. We assume that this negotiation takes place under asymmetric information: each manager knows some but not all of the decision-relevant information. Last, we treat the contribution margin resulting from this project as endogenous in that it can be increased by the managers making relationship-specific investments. We consider two kinds of such relationship-specific investments: in capital assets and in learning-by-doing.

It is well known from the incomplete contracting literature that, because of "holdup" problems, managers underinvest in relationship-specific assets if these investments are non-contractible. Information asymmetries at the implementation stage exacerbate this under-investment problem because the attendant bargaining inefficiencies result in some forgone profitable projects (Myerson and Satterthwaite 1983).[3] In short, with managers' compensation solely dependent on divisional income, the firm suffers both an *ex ante* underinvestment and an *ex post* under-implementation problem.

We ask to what extent these inefficiencies can be mitigated by adding NPMs to compensation contracts that are otherwise linear in divisional income: in addition to receiving a share of his own-division profit, each division manager is paid a discrete *bonus* whenever the joint project is successfully implemented. That is, we treat the (discrete) project implementation decision as the NPM.[4] Tying bonuses to the completion of major projects is consistent with observed practice. For example, Ittner et al. (1997, 239) find that: "The most frequently disclosed nonfinancial measure is customer satisfaction ... *followed by nonfinancial strategic objectives (e.g., completion of an acquisition, project milestones, or corporate restructuring activities) (28.0%)*" (emphasis added). Further, Bouwens and van Lent (2007) find empirically that firms' use of NPMs is positively correlated with the extent of interdivisional externalities and of division managers' investment authority.[5]

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[1] In a recent survey 80 percent of senior executives said that effective collaboration across product, functional, and geographic lines was crucial for growth, yet only 25 percent described their organizations as "effective" at sharing knowledge across boundaries (McKinsey 2005).

[2] See Merchant (1989), Bushman et al. (1995), Keating (1997), and Abernethy et al. (2004).

[3] There is a small literature on holdup problems with asymmetric information, (e.g., Tirole 1986; Riordan 1990; Baldenius 2000, 2006; Baiman and Rajan 2002).

For the case of investments in capital assets, our main result establishes that the optimal implementation bonus trades off "conditional over-implementation" with "conditional underinvestment." That is, given the induced *ex post* bargaining behavior, the firm would be better off if the investing manager were to invest more upfront. At the same time, holding fixed the equilibrium upfront investment, the managers are *too eager*, from the principal's point of view, to implement the joint project. That is, the corporate contribution margin would be higher at the induced investment level if, *ex post*, the project were implemented less often. The intuition for this result is the following. Increasing the implementation bonuses increases the implementation probability *and* the upfront investment. However, even if the managers' *ex post* implementation incentives were conditionally efficient, they would still underinvest because of the holdup problem. Increasing the bonuses slightly will then cause only a second-order loss in terms of *ex post* over-implementation but a first-order gain with respect to *ex ante* investments. An empirical implication of this result is that, cross-sectionally, implementation bonuses will be higher in industries and firms with greater investment opportunities, which is precisely the finding reported in Bouwens and van Lent (2007).

The second form of relationship-specific investment we consider is learning-by-doing. In many cases, divisions within firms transact repeatedly over time. As a result of learning-by-doing, then, future projects will often be more profitable to the divisions if they have successfully implemented earlier projects. As shown by Hadlock and Lewis (2003), in the absence of a third party mediating the exchange, managers will bargain less aggressively over early projects in order to realize these learning benefits. Thus, conciliatory bargaining at an early stage can be interpreted as a relationship-specific investment in a dynamic setting. This raises the question of how the firm should optimally adjust the implementation bonuses to facilitate learning and optimal project implementation.

To address the issue of learning-by-doing, we consider a two-period version of our base model: the period-2 joint project will be stochastically more profitable if the two divisions have implemented the period-1 joint project. We show that the optimal period-2 incentive schemes will be conditioned on whether the period-1 project was implemented: if it was, then period-2 implementation bonuses will be *higher* than if it was not. Empirically therefore our model predicts positive serial correlation in implementation bonuses, which complements earlier findings on "fast tracks" in promotions (Baker et al. 1994; Bernhardt 1995). The anticipated increase in the period-2 bonus resulting from period-1 project implementation provides the divisional managers with incentives to negotiate more cooperatively in period 1. In fact, we show that this effect is so strong that the optimal period-1 bonus with learning effects has to be *lowered* relative to that without learning so as to prevent excessive project implementation in period 1.

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[4] Note that the performance metric is the binary implementation decision and not the attendant contribution margin (which is often hard to disaggregate)—hence the label "nonfinancial."

[5] Bouwens and van Lent (2007, 4) summarize their findings as follows: "[W]hereas the use of accounting return measures is correlated with the authority of business unit managers ... nonfinancial measures are employed to provide incentives for managers to cooperate in the presence of interdependencies between business units."

The previous theoretical literature has focused on the role of NPMs as leading indicators of future financial performance.[6] A key insight from that literature is that NPMs and (future) financial metrics are *substitutes* in eliciting agents' effort. Our analysis, in contrast, focuses on the strategy-aligning role of NPMs as instruments to achieve cross-divisional cooperation.[7] Based on this rationale, NPMs and divisional financial metrics should be *complements*: NPMs are successful in directing managers' attention toward cooperation only if the assigned incentive weight is sufficiently high relative to that on the divisional financial metrics. These opposite predictions may allow empiricists to discriminate between the two theories of NPMs in future studies.

The successful implementation of a project is a valuable contracting signal, in part because it is informative about otherwise noncontractible variables such as relationship-specific investments. In addition, we show that the use of NPMs is valuable because it mitigates implementation inefficiencies by encouraging increased information sharing among the divisions. The implementation bonus in our model is essentially an instrument that allows the principal to act as a budget-breaker in the divisions' negotiations. The efficiency-enhancing role of a budget-breaker ("broker") has been shown by Myerson and Satterthwaite (1983) in a pure adverse selection setting and by Holmstrom (1982) in a pure moral hazard setting. Our model extends their reasoning by incorporating relationship-specific investments.

The remainder of this article is organized as follows. Section II studies implementation bonuses when relationship-specific investments are in fixed assets. Section III considers a dynamic model where investment takes the form of learning. Section IV concludes.

II. THE MODEL

Consider a firm, owned by a risk-neutral principal, which consists of two divisions (s and b), each run by a risk-neutral agent. By exerting effort a_i, agent i increases his own division's profit by a_i. Agent i's personal disutility of effort is $v_i(a_i, z_i) = z_i d_i(a_i)$, where $d_i(\cdot)$ is an increasing, convex function. The random variable $z_i \in [\underline{z}_i, \bar{z}_i] \subset \mathbf{R}^+$ represents agent i's effort disutility parameter, which is privately known by agent i. In addition, the two division managers may cooperate by implementing a joint project (henceforth, the project). We model the implementation of the project as an exercise in team production requiring the pooling of inputs from division s (e.g., engineering support, knowledge from R&D, materials, manufacturing expertise, supplier lists) and division b (e.g., customer lists, marketing expertise). Without loss of generality, division b receives the entire revenue from the project. Hence, the negotiations involve whether the project will be implemented and, if so, the payment division b makes to division s for its contributions.[8] We consider two forms of value-increasing relationship-specific investments: in capital assets such as PP&E (this section) and in learning-by-doing (Section III).

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[6] See, for example, Hauser et al. (1994), Dikolli (2001), Sliwka (2002), Dutta and Reichelstein (2003), and Budde 2007. While empirical studies have found NPMs to be informative about future financial performance, the observed lead times can be quite short with the revenue effects of NPMs often materializing in less than one year (Banker et al. 2000; Nagar and Rajan 2001). In light of the well-publicized problems associated with implementing NPMs (Ittner and Larcker 2003), this indicates that these metrics might serve additional purposes beyond the leading indicator function.

[7] In this sense, our view of NPMs is consistent with the earlier Management By Objectives (MBO) literature. For example, Etzel and Ivancevich (1974) note that among the benefits of MBO is that it "can point out where greater coordination between managers is required." Barton (1981, 231) states that "MBO is a means for coordinating decentralized self-controlled actions of managers to achieve the overall goals and objectives ... of an organization." A recent related theory article is Dye (2005).

[8] Since one division receives all of the revenues from the joint project, we refer to that division as b, the "buyer" division, and to the other division as s, the "supplier" division.

Agent s (the manager of division s) can make an upfront capital investment that will reduce the subsequent (stochastic) cost his division incurs if the joint project is implemented, θ_s. In particular, to reduce this implementation cost by an amount I requires an out-of-pocket investment cost to division s of $C(I)$, where $C(\cdot)$ is an increasing and convex function with $C'(0) = 0$. After agent s has invested in I, he privately observes the realization of a random cost parameter, θ_s, while agent b privately observes θ_b, the revenue (net of its own costs) his division will realize if the project is implemented. We use the indicator variable $q \in \{0,1\}$ for the project implementation decision so that $q = 1$ if the two divisions jointly implement the project, and $q = 0$ otherwise. If $q = 1$, then division b pays an amount t (negotiated by the divisions) to division s. The divisional income measures are given by:

$$\begin{aligned} \pi_s &= a_s + M_s(\theta_s, I, t)q - C(I), \\ \pi_b &= a_b + M_b(\theta_b, t)q, \end{aligned} \tag{1}$$

where the respective project-related contribution margins M_i, $i = s, b$, are:

$$\begin{aligned} M_s(\theta_s, I, t) &= t - (\theta_s - I), \\ M_b(\theta_b, t) &= \theta_b - t. \end{aligned} \tag{2}$$

We use the vector notation $\theta = (\theta_s, \theta_b)$ and $z = (z_s, z_b)$. Note that, for a given investment I, $C(I)$ is a sunk cost that is incurred by division s regardless of whether the project is subsequently implemented. Note also that the θ realizations affect divisional profit only if the project is implemented, while the a_i's are unrelated to the project (hence, "general-purpose" effort).[9]

We restrict our analysis to linear compensation plans for each agent i:

$$s_i(\tilde{z}, \pi_i, q) = \alpha_i(\tilde{z}) + \beta_i(\tilde{z})\pi_i + \gamma_i(\tilde{z})q. \tag{3}$$

Agent i's compensation thus consists of fixed salary, α_i; a variable component proportional to his own division's income with coefficient β_i; and an *implementation bonus,* γ_i, paid if and only if the project is implemented. That is, the project implementation decision ($q = 1$) represents the NPM in our setting, and γ_i is the weight attached to this measure in agent i's compensation. Agent i's payoff then equals $U_i = \alpha_i + \beta_i\pi_i + \gamma_i q - v_i(a_i, z_i)$. We denote by $S = (\alpha, \beta, \gamma)$ the collection of contract parameters with $\alpha = (\alpha_s, \alpha_b)$, $\beta = (\beta_s, \beta_b)$ and $\gamma = (\gamma_s, \gamma_b)$.

At this point it is useful to clarify the scope of our analysis. As noted above, we take several stylized facts from the empirical literature as given; in particular that divisional performance is the key driver of division managers' compensation. Our model therefore ignores firm-wide profit sharing altogether and instead only allows for NPMs to supplement divisional profit metrics. Note however that even if some (but not all) compensation weight were put on firm-wide profits, our analysis and results would continue to hold.[10] We also assume that the divisional accounting performance measure is aggregate divisional profits, π_i, rather than its individual components, $(a_i,\ t,\ M_i(\cdot),\ C(I))$.[11] Although top management may, in theory, demand unobstructed access to each division's books, one of the motivations for decentralization is to economize on the amount of information communicated between the divisions and top management and to afford division management discretion in their actions so as to develop their decision-making skills (Solomons 1965). The latter purpose is undermined by top management's use of highly disaggregated performance measures (Abernethy et al. 2004).

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[9] Instead of cost-reducing investments, we can model revenue-enhancing investments by agent b analogously. Our model could be extended to bilateral investments at the cost of additional structure.

The sequence of events is as follows:

Date 1. The agents privately observe their respective z_i's. The densities and cumulative distributions of the disutility parameters are independent and represented by $g_i(z_i)$ and $G_i(z_i)$. The usual monotone inverse hazard rate condition applies, i.e., $H_i(z_i) \equiv G_i(z_i)/g_i(z_i)$ is increasing.

Date 2. The owner publicly offers each of the agents a menu of contracts that specifies the compensation schedule for each agent.

Date 3. The agents pick compensation contracts from their menus by submitting type reports $\tilde{z} = (\tilde{z}_s, \tilde{z}_b)$. These reports are made public by the principal. The agents choose whether to quit the job or stay. If they decide to stay with the firm, then they commit to not leave in the future, regardless of the subsequent cost or revenue realizations θ.

Date 4. Each agent i chooses his effort a_i. In addition, agent s chooses his cost-reducing project-specific investment I. I is observable to agent b but not to the principal.[12]

Date 5. Each agent i privately observes his cost or revenue realization, θ_i, where θ_i is uniformly distributed over the unit interval [0,1]. The θ_i realizations are independent of each other and of the z_i realizations.

Date 6. The agents negotiate over the implementation of the project according to the bargaining protocol specified below. The agents are compensated and the game concludes.

The First-Best Solution

In the first-best benchmark solution, the principal observes all relevant information directly and makes all decisions herself or, equivalently, instructs the agents to make the decisions on her behalf. The only constraint the principal faces is to ensure that the agents earn their reservation utility—normalized to zero—at Date 3. By backward induction, the first-best implementation rule for any (I, θ) is given by:

$$q^{fb}(I, \theta) = 1 \text{ if and only if } \theta_b - \theta_s + I \geq 0. \tag{4}$$

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[10] We exclude firm-wide profit sharing in order to highlight the efficiency-enhancing role of NPMs. Our analysis suggests that NPMs and firm-wide profit sharing are substitutes in mitigating interdivisional externalities. See further discussion of this point in the "Conclusion."

[11] Assumptions that only aggregate information is contractible are standard in the literature (Laffont and Tirole 1986).

[12] The assumption that I is observable to the downstream division is not essential. All results would go through qualitatively if agent b only were to anticipate these investments in equilibrium given that compensation contracts are public information (e.g., Tirole 1986).

Before learning θ, the principal solves the *first-best (FB) program*:

$$P^{FB}: \max_{a,I}\{\Pi^{fb}(a, I) \equiv \sum_{i=s,b} [a_i - v_i(a_i, z_i)] + E_\theta[(\theta_b - \theta_s + I)q^{fb}(I, \theta)] - C(I)\}. \tag{5}$$

By the Envelope Theorem, the following first-order conditions solve program P^{FB}:

$$1 - z_i d_i'(a_i^{fb}(z_i)) = 0, \quad i = s, b, \tag{6}$$

$$Q^{fb}(I^{fb}) - C'(I^{fb}) = 0, \tag{7}$$

where $Q^{fb}(I) \equiv Pr[q^{fb}(I, \theta) = 1] = \int_0^I \int_0^1 d\theta_b d\theta_s + \int_I^1 \int_{\theta_s - I}^1 d\theta_b d\theta_s = \frac{1}{2}[1 + 2I - I^2]$ denotes the first-best project implementation probability for a given investment. Intuitively, by (7), the greater the probability $Q^{fb}(I)$, the greater the marginal expected investment return and, therefore, the greater the first-best investment I^{fb}.

Delegation Schemes

We now analyze a delegation scenario in which the agents privately and sequentially observe their $\{z_i,\theta_i\}$ realizations and choose their reporting, general-purpose effort, investment, and project implementation decisions so as to maximize their individual payoffs given the incentive contracts chosen by the principal. Among the key reasons for firms to decentralize is costly or restricted communication (Melumad et al. 1997). Our model reflects this by assuming that, while managers can communicate to the principal their respective disutility parameters $\tilde{z}$ at Date 3, they cannot communicate the subsequent realizations of the divisional cost and revenue realizations, θ, related to the joint project. This assumption is motivated by the fact that the z_i's relate to the agents' general purpose efforts and are presumably fairly stable for the entire period, whereas the θ_i's are project-specific. The joint projects potentially available to a firm's divisions may be quite diverse, each with different spaces of cost and revenue realizations. As the number, variety, and complexity of these potential projects increase, so would the cost of reporting their cost and revenue realizations to the principal. Therefore, the division managers negotiate the implementation of the project in a decentralized fashion and their contract parameters are contingent only on $\tilde{z}$.[13] The principal only observes the individual divisional profits, π_i, and whether the project has been implemented, q.[14]

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[13] For example, from personal conversations we are aware that at General Electric divisions negotiate with each other on a regular basis over potential major infrastructure, energy, or security projects that would require cooperation across several of GE's divisions. These negotiations include both whether the potential projects are accepted and the allocation of (net) revenues among the divisions. Other examples include a division considering a client's offer to buy bundled services that are in part provided by other divisions; again this requires interdivisional negotiations as to whether the offer should be accepted and, if so, the split of the surplus ("cross-selling").

[14] Note that, given the informational assumptions, the principal cannot achieve the first-best solution by selling the divisions to the agents because, at the contracting stage (Date 3), the agents are privately informed as to their respective disutility parameters, z, and are protected by individual rationality.

We apply backward induction to analyze the delegation setting: first, we solve the Date 6 bargaining game, then derive the Date 4 effort and investment choices, and finally solve the principal's Date 2 contracting problem.

The Bargaining Mechanism

At Date 6, the agents negotiate over the implementation of the project. We model the negotiation process using the following reduced-form bargaining protocol. The agents simultaneously and non-cooperatively submit a sealed bid (agent b) and a sealed ask (agent s), $\sigma = (\sigma_b, \sigma_s)$, regarding their costs and revenues for the project (Chatterjee and Samuelson 1983). If agent b's bid σ_b exceeds agent s's ask σ_s, then $q(\sigma) = 1$ and $t(\sigma) = \frac{1}{2}(\sigma_b + \sigma_s)$. If $\sigma_b < \sigma_s$, then $q(\sigma) = t(\sigma) = 0$. Agent s's incremental payoff, if $q = 1$, is $\beta_s(t - \theta_s + I) + \gamma_s$, while agent b's incremental payoff is $\beta_b(\theta_b - t) + \gamma_b$. A Bayesian-Nash equilibrium in bids for this sealed-bid (double-auction) mechanism is given by:

$$\sigma_s(\theta_s|\omega) \in \arg\max_{\sigma_s} E_{\theta_b}\left[\beta_s\left(\frac{\sigma_s + \sigma_b(\theta_b|\omega)}{2} - \theta_s + I + \frac{\gamma_s}{\beta_s}\right) q(\omega, \theta)\right],$$

$$\sigma_b(\theta_b|\omega) \in \arg\max_{\sigma_b} E_{\theta_s}\left[\beta_b\left(\theta_b - \frac{\sigma_s(\theta_s|\omega) + \sigma_b}{2} + \frac{\gamma_b}{\beta_b}\right) q(\omega, \theta)\right], \qquad (8)$$

where $\omega = \{S, I, \tilde{z}\}$ summarizes the publicly known information. Throughout the analysis, we restrict attention to linear bidding strategies.[15]

Lemma 1: For the class of linear bidding strategies, the equal-split sealed-bid mechanism yields the following unique equilibrium bidding strategies:

$$\sigma_s(\theta_s|\omega) = \begin{cases} \dfrac{1 - 3\left(I + \dfrac{\gamma_s}{\beta_s}\right) + 9\dfrac{\gamma_b}{\beta_b}}{12}, & \theta_s \leq \theta_s^o(0, \omega) \\[2ex] \sigma_s^o(\theta_s|\omega) = \dfrac{3 - 9\left(I + \dfrac{\gamma_s}{\beta_s}\right) + 3\dfrac{\gamma_b}{\beta_b} + 8\theta_s}{12}, & \theta_s \in (\theta_s^o(0, \omega), \theta_s^o(1, \omega)) \\[2ex] \theta_s - \left(I + \dfrac{\gamma_s}{\beta_s}\right), & \theta_s \geq \theta_s^o(1, \omega) \end{cases} \qquad (9)$$

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[15] As shown by Leininger et al. (1989), there exist many other equilibria. Yet, the linear strategies we focus on yield the unique equilibrium strategies within the class of polynomial strategies. Moreover, Radner and Schotter (1989) and Daniel et al. (1998) find the bidding strategies employed by players in experimental settings to be broadly consistent with this linear equilibrium.

$$\sigma_b(\theta_b|\omega) = \begin{cases} \dfrac{11 - 9\left(I + \dfrac{\gamma_s}{\beta_s}\right) + 3\dfrac{\gamma_b}{\beta_b}}{12}, & \theta_b \geq \theta_b^o(1, \omega) \\ \sigma_b^o(\theta_b|\omega) = \dfrac{1 - 3\left(I + \dfrac{\gamma_s}{\beta_s}\right) + 9\dfrac{\gamma_b}{\beta_b} + 8\theta_b}{12}, & \theta_b \in (\theta_b^o(0, \omega), \theta_b^o(1, \omega)) \\ \theta_b + \dfrac{\gamma_b}{\beta_b}, & \theta_b \leq \theta_b^o(0, \omega) \end{cases} \qquad (10)$$

with the θ_i-type cutoffs implicitly defined by $\sigma_i(\theta_i^o(\theta_j, \omega), \omega) \equiv \sigma_j(\theta_j, \omega)$:

$$\theta_s^o(\theta_b, \omega) = \theta_b - \frac{1}{4}\left[1 - 3\left(I + \frac{\gamma_s}{\beta_s} + \frac{\gamma_b}{\beta_b}\right)\right] \text{ and}$$

$$\theta_b^o(\theta_s, \omega) = \theta_s + \frac{1}{4}\left[1 - 3\left(I + \frac{\gamma_s}{\beta_s} + \frac{\gamma_b}{\beta_b}\right)\right]. \qquad (11)$$

Proof: All proofs are found in the Appendix.

Let $Q_i(\theta_i, \omega) \equiv E_{\theta_j}[q(\theta_i, \theta_j, \omega)]$ denote the conditional project implementation probability for a given type θ_i. The top branches of (9) and (10) state the optimal bids for those types θ_i, respectively, for which implementation is ensured, i.e., $Q_i(\theta_i, \omega) = 1$. The middle branches characterize the interior solutions in which $Q_i(\theta_i, \omega) \in (0, 1)$; and the bottom branches give the optimal bids when $Q_i(\theta_i, \omega) = 0$.[16] To ensure a nontrivial implementation problem exists, we assume throughout that the relevant valuation supports of the agents (i.e., factoring in the implementation bonuses) overlap for all ω, that is:

$$1 - I - \left(\frac{\gamma_s}{\beta_s} + \frac{\gamma_b}{\beta_b}\right) > 0. \qquad (12)$$

A sufficient condition for this to be the case is that the investment cost function $C(\cdot)$ is sufficiently convex, ruling out equilibrium investment amounts that are too large.

A few observations can be drawn immediately from inspecting (9)–(11). First, note that the agents' bid and ask do not *directly* depend on either the private information z or the reported information $\tilde{z}$. The reason for this is that the effects of the general purpose efforts and the joint project enter the divisional profits in an additively separable fashion. The z and $\tilde{z}$ have an *indirect* effect on the bid/ask, however, through their effect on the compensation parameters γ and β. This can be seen from (8). Second, for a given investment I, the *individual magnitudes* of γ_i and β_i are immaterial for the bidding strategies, only the *ratios* (γ_i/β_i) matter. Hereafter we refer to (γ_i/β_i) as the *scaled implementation bonuses.*

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[16] That is, any $\theta_s \leq \theta_s^o(1, \omega)$ will result in a bid $\sigma_s(\theta_s, \omega) \leq \sigma_s(\theta_s^o(1, \omega), \omega) = \sigma_b(1, \omega)$, such that there exists a θ_b at which trade would occur, in which case agent s should submit a feasible ask. An extended discussion of the boundary conditions is provided in Chatterjee and Samuelson (1983).

Related to the second implication, Lemma 1 implies that each agent's bid/ask $\sigma_i(\theta_i|\omega)$ is decreasing in I and (γ_s/β_s), but increasing in (γ_b/β_b). An increase in agent s's investment I lowers his divisional-relevant project cost and hence leads to a lower ask, $\sigma_s(\theta_s|\omega)$. In equilibrium, agent b will react to this opportunistically by also lowering his bid, $\sigma_b(\theta_b|\omega)$. To illustrate the link between the contract parameters and the agents' bid and ask, note that agent i's payoff from the transaction consists of two parts: he receives a share β_i of his own-division income and the implementation bonus γ_i. Conditional on q, the magnitude of the implementation bonus is unaffected by the size of the bid or ask submitted. Thus, the greater γ_i the more willing is agent i to sacrifice his own division profit in order to assure that the project is implemented. Put differently, the scaled implementation bonus (γ_i/β_i) measures agent i's "eagerness" to cooperate: the higher this ratio, the more conciliatory will be agent i's bidding behavior. In equilibrium, the other agent will anticipate this and bid more aggressively.[17]

We next evaluate these countervailing effects of changes in the contract parameters on the agents' bargaining strategies. Let $Q(\omega)$ denote the probability of the project being implemented and $M(\omega)$ the expected firm-wide contribution margin resulting from that implementation:

$$Q(\omega) = Pr[q(\omega, \theta) = 1] = \int_0^{\max\{0,\theta_s^o(0,\omega)\}} \int_0^1 d\theta_b d\theta_s + \int_{\max\{0,\theta_s^o(0,\omega)\}}^{\min\{1,\theta_s^o(1,\omega)\}} \int_{\theta_b^o(\theta_s,\omega)}^1 d\theta_b d\theta_s, \qquad (13)$$

$$M(\omega) = \int_0^{\max\{0,\theta_s^o(0,\omega)\}} \int_0^1 [\theta_b - \theta_s + I] d\theta_b d\theta_s + \int_{\max\{0,\theta_s^o(0,\omega)\}}^{\min\{1,\theta_s^o(1,\omega)\}} \int_{\theta_b^o(\theta,\omega)}^1 [\theta_b - \theta_s + I] d\theta_b d\theta_s,$$

where the integral boundaries are defined in (11). Further analysis of (13) together with (11) and the earlier observations based on (9) and (10) show that for any given I, only the *sum* of the scaled implementation bonuses, hereafter denoted by:

$$\Gamma \equiv \frac{\gamma_s}{\beta_s} + \frac{\gamma_b}{\beta_b},$$

matters for $Q(\omega)$ and $M(\omega)$, but not the individual coefficients γ_i and β_i or the individual ratios, γ_i/β_i. The higher Γ, the more the compensation system (in aggregate) weights the NPM q relative to divisional profit. We then have:

Lemma 2: Holding constant agent s's investment I, then for $\beta_i > 0$ and $\gamma_i \geq 0$, the implementation probability $Q(\omega)$ is strictly increasing in Γ for all Γ, and the project's expected payoff $M(\omega)$ is strictly increasing in Γ for Γ sufficiently small.

Thus, the direct effect of a change in agent i's contract parameters on his bargaining behavior dominates the indirect effect on the other agent's bargaining strategy. One way to interpret this finding is that implementation bonuses enhance information sharing between the agents in the course of negotiations, thereby mitigating the inefficiency arising from private information. As a result, an increase in either agent's implementation bonus γ_i makes the project more likely to be implemented and (for small Γ) more efficient, whereas an increase in either agent's contract slope β_i has the reverse effect. It can be shown that $M(\cdot)$ is single-peaked in Γ, i.e., increasing Γ raises expected trading surplus up to a point, and decreases it thereafter. Setting the implementation bonuses too high induces the agents to engage in projects that are unprofitable for the firm as a whole.

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[17] Note also that if there were no implementation bonuses, i.e., $\gamma_s = \gamma_b = 0$, each agent's bidding incentives would be independent of both contract slopes, β.

In choosing $\{\beta, \gamma\}$, however, the principal also has to consider the effects on the agents' effort and investment choices. We analyze those decisions next.

The Effort and Investment Decisions

Recall from our earlier discussion that for a given $S = (\alpha, \beta, \gamma)$, neither the bid nor the ask vary in z or $\tilde{z}$. The same thus will hold for t and for the indicator variable, q. The agents' respective utilities evaluated at Date 4 (prior to the agents observing their respective θ_i's) can therefore be written as:

$$\begin{aligned} U_s(S, a_s, I|z_s) &= \alpha_s + \beta_s \left\{ a_s + E_\theta \left[\left(t(\theta, S, I) - \theta_s + I + \frac{\gamma_s}{\beta_s} \right) q(\theta, S, I) \right] - C(I) \right\} \\ &\quad - v_s(a_s, z_s) \\ U_b(S, a_b, I|z_b) &= \alpha_b + \beta_b \left\{ a_b + E_\theta \left[\left(\theta_b - t(\theta, S, I) + \frac{\gamma_b}{\beta_b} \right) q(\theta, S, I) \right] \right\} \\ &\quad - v_b(a_b, z_b). \end{aligned} \tag{14}$$

From (14) the necessary and sufficient first-order condition for a_i is:

$$\beta_i - z_i d_i'(a_i(\beta_i, z_i)) = 0. \tag{15}$$

Agent i's effort choice depends solely on his own disutility parameter z_i and on his contract slope parameter β_i.

Now consider agent s's investment decision at Date 4. As shown in detail in the Appendix (proof of Lemma 3), the latter is determined by the first-order condition:

$$\frac{3}{4} Q(I(S), S) - D(I(S), S) - C'(I(S)) = 0, \tag{16}$$

where $D(\cdot,\cdot)$ is a weakly positive function of I and Γ. We assume throughout that the investment cost function $C(\cdot)$ is sufficiently convex so that condition (16) is both necessary and sufficient. Comparing (16) with the first-order condition for first-best investment (7) shows that agent s will underinvest in the delegation setting. First, the total *ex post* return to the investment is suboptimal in that $Q(I(S), S) < Q^{fb}(I)$ for small Γ and for any I. Second, in the process of bargaining, agent s will have to share the investment return with agent b, which reflects the familiar holdup problem. We now establish an important property of the induced investment:

Lemma 3: Agent s's investment is increasing in Γ, i.e., $I'(\Gamma) > 0$.

Because of the implementation-enhancing effect of Γ (Lemma 2), agent s will invest more, the higher the total scaled implementation bonus to be paid out.

Our next result establishes a key property of the contracting problem:

Lemma 4: (The Unraveling Property): Agent s's equilibrium investment $I(S)$, the equilibrium implementation probability $Q(I(S), S)$, and the expected firm-wide contribution margin $M(I(S), S)$ depend on the compensation parameters $S = (\alpha, \beta, \gamma)$ only via Γ. That is, $I(S) = I(\Gamma)$, $Q(I(S), S) = Q(I(\Gamma), \Gamma)$, and $M(I(S), S) = M(I(\Gamma), \Gamma)$.

To illustrate the intuition underlying the Unraveling Property, it is useful to look at the special case of identical contract slopes, i.e., $\beta_s = \beta_b = \beta$. Lemma 4 then implies that for a given β only the sum $(\gamma_s + \gamma_b)$ matters from an incentive perspective. Suppose the principal raises agent s's implementation bonus γ_s while lowering γ_b by the same amount. Agent s is now more eager to implement the project and, hence, will bid less aggressively at the negotiation stage. Intuition might suggest that agent s would therefore invest more. However, agent b will bid *more* aggressively in equilibrium, because (1) he is *less* eager to implement the project as his implementation bonus has decreased and (2) he anticipates the change in agent s's bidding behavior. Agent b's induced more aggressive bidding behavior moderates agent s's enhanced incentive to invest. In equilibrium, these changes in the bidding strategies *cancel each other precisely* with the result that agent s's investment incentives as well as the expected firm-wide gains from implementing the project remain unchanged. More generally, for different contract slopes, $\beta_s \neq \beta_b$, the Unraveling Property has to be interpreted in terms of the *scaled* implementation bonuses. Finally, note that the Unraveling Property is not an artifact of our assumption that the bargaining is equal-split, but holds for any $t = k\sigma_s + (1 - k)\sigma_b$, where $0 \leq k \leq 1$ (a proof is available from the authors on request).

The Principal's Problem

The principal's contracting problem at Date 2 anticipates the outcome of the above bargaining mechanism as well as the agents' induced effort and investment choices. The principal's *ex post* payoff is given by:

$$\begin{aligned}\Pi(S, a_s, a_b, I) \equiv \sum_{i=s,b} &- [\alpha_i + \gamma_i Q(S, I)] \\ &+ (1 - \beta_s)[a_s + E_\theta\{[t(\theta, S, I) - \theta_s + I]q(\theta, S, I)\} - C(I)] \\ &+ (1 - \beta_b)[a_b + E_\theta\{[\theta_b - t(\theta, S, I)]q(\theta, S, I)\}].\end{aligned}$$

The principal's optimization program at Date 2 under delegation then is:

$$P^{del} : \max_{S(z)} E_z[\Pi(S, a_s(S|Z_s), a_b(S|z_b), I(S))]$$

subject to:

(15), (16) and, for all $i, j \neq i, z_i, \tilde{z}_i$:

$$z_i \in \arg\max_{\tilde{z}_i} E_{z_j}[U_i(S(\tilde{z}_i, z_j), a_i(S(\tilde{z}_i, z_j)|z_i), I(S(\tilde{z}_i, z_j))|z_i)]$$

$$E_{z_j}[U_i(S(z), a_i(S(z)|z_i), I(S(z))|z_i)] \geq 0.$$

Constraints (15) and (16) describe the agents' effort and investment choices at Date 4. The next two constraints ensure that truthful reporting of types is a Bayesian-Nash equilibrium at the reporting stage (Date 3). The last two constraints are the (interim) individual rationality constraints with reservation utilities normalized to zero.

Since the agents privately observe their respective disutility parameter, z_i, before accepting their contracts and are protected by individual rationality, they will earn informational rents on their pre-contractual private information about their respective disutility parameter, z_i. However, because they commit at Date 3 to stay on the job for any future realization of θ, the agents will not earn any incremental informational rents based on their private information about parameters θ. Further, recall that the investment and project implementation decisions are not directly dependent on the actual or reported disutility parameters. Applying standard techniques for adverse selection problems, we thus find that, by "local" incentive compatibility, agent i's informational rent equals:

$$U_i(z_i) = U_i(\bar{z}_i) + \int_{z_i}^{\bar{z}_i} d_i(a_i^*(\zeta))d\zeta, \tag{17}$$

with $U_i(\bar{z}_i) = 0$ in the optimal solution and second-best effort levels $a_i^*(z_i)$ given by:

$$1 - d_i'(a_i^*(z_i))[z_i + H_i(z_i)] = 0, \tag{18}$$

where, again, $H_i(z_i) \equiv G_i(z_i)/g_i(z_i)$. This first-order condition for effort incorporates the agents' "virtual disutilities" of effort, i.e., the sum of the disutility of effort and the informational rent. As is standard in adverse selection problems, in order to economize on the informational rents earned by the more efficient types, the effort input of less efficient types is distorted downward relative to first-best, i.e., $a_i^*(z_i) < a_i^{fb}(z_i)$ for all $z_i > \underline{z}_i$.

We solve the principal's program P^{del} in two steps. First, starting from a contract without any NPM, we show in Proposition 1 (a "local" result) that attaching a small but strictly positive compensation weight on the NPM makes the principal strictly better off. Proposition 2 then characterizes the globally optimal weight on the NPM.[18]

Proposition 1: For any incentive-compatible and individually rational contract that involves $\Gamma = 0$, there exists another incentive-compatible and individually rational contract with a strictly positive but arbitrarily small Γ that strictly increases the principal's expected payoff, leaving the agents' expected payoffs unaffected.

The principal always strictly prefers to incorporate the NPM into the compensation scheme. The reason for this is that increasing Γ infinitesimally mitigates both types of inefficiency that are present at $\Gamma = 0$. Starting from $\Gamma = 0$, and holding constant the contract slopes β, increasing Γ increases the project implementation probability, Q, and thereby agent s's investment, I, and increases the firm-wide expected contribution margin, M (by Lemmas 2 and 3). The principal can extract any additional surplus thus generated by adjusting the agents' fixed salaries α.

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[18] Note that Proposition 2 does not imply, or subsume, Proposition 1, because we cannot take for granted that the principal's problem is single-peaked in Γ.

Proposition 1 is related to, but not implied by, the Informativeness Principle (Holmstrom 1979). The latter depends on the principal being able to commit to the individual contract parameters. In our model, in the course of bargaining, the agents "unravel" the compensation contracts to which the principal has committed, introducing an element of contractual incompleteness. Thus, the Informativeness Principle and the intuition that underlies it are not directly applicable to our setting.

In our model the principal uses the implementation bonus to intervene as a budget breaker in the agents' bargaining game. While Myerson and Satterthwaite (1983) have demonstrated the efficiency-enhancing role of a budget breaker in a pure exchange model, Proposition 1 shows that this logic extends to settings where managers can undertake upfront investments. Budget breaking then has the additional benefit of mitigating holdup problems.[19]

We next characterize the *optimal* solution to program P^{del}. The preceding analysis suggests the following algorithm for solving the principal's program. Suppose both agents have truthfully reported $\tilde{z} = z$ at Date 3. First, choose $\beta_i(\tilde{z}_i)$ so as to induce the optimal (second-best) effort input given in (18). Conditional on $\beta_i(\tilde{z}_i)$, pick implementation bonus amounts $\gamma(\tilde{z}_i)$, which result in the value of Γ that optimally coordinates the investment and project implementation decisions. We denote this optimal total scaled implementation bonus by Γ^*. Note that by the Unraveling Property there will be a degree of freedom regarding the individual γ_i's. We therefore perform a change of variables and use $(\{\alpha_i, \beta_i\}_{i=s,b}, \Gamma)$ as the principal's choice variables. The agents' fixed salaries $\alpha(\tilde{z})$ are then chosen so as to extract the project-related surplus and effectively leave agent i who has reported type $\tilde{z}_i$ with compensation equal to $v_i(a_i^*(\tilde{z}_i), \tilde{z}_i) + U_i(\tilde{z}_i)$. As a last step, we verify that the agents indeed have incentives to truthfully report $\tilde{z}_i = z_i$.

Provided the agents have truthfully reported their types z, a comparison of (18) with the first-order conditions for the agents' effort choices in (15) shows that the agents will choose their respective second-best effort levels if and only if:

$$\beta(z) = \beta^*(z) \equiv \frac{z_i}{z_i + H_i(z_i)}. \tag{19}$$

Note that $0 < \beta^*(z) \leq 1$, hence we have a proper sharing rule.

The investment and implementation decisions induced by the optimal contract are further characterized in our next main result.

Proposition 2: The optimal solution to the principal's program P^{del} entails a total scaled implementation bonus Γ^*, which induces *ex ante* underinvestment and *ex post* excess project implementation in the sense that:

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[19] There are a number of differences between our model and that of Myerson and Satterthwaite (1983). They consider a more general bargaining model using direct revelation mechanisms in which the agents can quit the relationship after learning their cost and revenue types (here, θ). We restrict attention to sealed-bid bargaining mechanisms to capture the decentralized nature of negotiations and to study the role of upfront investments that endogenize the type supports. Revelation mechanisms would perform better, *ex post*, than the sealed-bid mechanism but would require more involvement by the principal. Furthermore, revelation mechanisms only characterize the implementable allocations but not how the resulting surplus is split among the bargaining parties. This split, however, is key to understanding the upfront investment incentives for individual participants.

$$\frac{\partial}{\partial I} M(\Gamma^*, I(\Gamma^*)) > C'(I(\Gamma^*)),$$

$$\frac{\partial}{\partial \Gamma} M(\Gamma^*, I(\Gamma^*)) < 0.$$

Efficient investment from a firm-wide perspective requires that the marginal expected contribution margin, $\partial M/\partial I$, be equal to the marginal investment cost $C'(\cdot)$. Yet, as Proposition 2 shows, at the optimal Γ^*, agent s *underinvests* given the anticipated implementation probability. At the same time, holding constant I, the requirement for Γ to optimally regulate the agents' project implementation decision is $\partial M/\partial\Gamma = 0$. However, Proposition 2 shows that delegation results in conditional *over-implementation*, $\partial M/\partial\Gamma < 0$. The intuition behind these distortions can be gleaned from Lemmas 2 and 3, which show that the implementation probability Q, the firm-wide contribution margin M, and the upfront investment I, are all increasing in Γ for small Γ. Further, recall that even if Γ were chosen such that the managers had efficient incentives to implement the project conditional on the induced investment (i.e., $\partial M/\partial\Gamma = 0$), we would still have under-investment as a result of the holdup problem. Therefore, slightly increasing Γ causes a first-order gain with respect to the *ex ante* investment, but only a second-order loss due to *ex post* over-implementation.

To better understand the effect upfront investment opportunities have on the optimal implementation bonus, first note that if there were no such investment opportunity, that is $C'(0) \to \infty$, then the cost and revenue supports would be identical. Our model would then converge to the pure trading model of Myerson and Satterthwaite (1983) in which it is easy to show that full *ex post* (implementation) efficiency is achieved with $\Gamma^{**} \equiv \frac{1}{3}$.[20] Using this as a benchmark, we find:

Proposition 3: If $I(\Gamma = 0) > 0$, then $\Gamma^* > \Gamma^{**}$.

If there is a strictly positive equilibrium upfront investment even without any bonus ($\Gamma = 0$), then the optimal scaled total bonus will exceed the level that would have been optimal in a pure trading model. Put differently, an empirical implication of our model is that upfront investment opportunities in capital assets call for larger implementation bonuses, all else equal.[21] To provide more intuition for Proposition 3, first consider a variation of the pure trading model (i.e., $I = 0$) in which the support of the cost realization, Θ_s, is exogenously moved to the left. Holding all else fixed, the probability of successful implementation then increases. However, anticipating this, the agents will bid more aggressively. In response, the principal will choose a higher implementation bonus. In our model, the shift to the left of Θ_s is *endogenously* caused by agent s's upfront investment. This anticipated downward shift in the cost support, in conjunction with the present holdup problem, imply that $\Gamma^* > \Gamma^{**}$.

The preceding analysis suggests that while the general-purpose effort choice and the project-related decisions were assumed to be additively separable, they do interact through the principal's choice of Γ. Suppose that the adverse selection problem regarding the general-purpose effort becomes more severe in the sense of hazard rate dominance. In response, the β_i's must be reduced to economize on informational rents. However, if the project-related parameters remain unchanged, then Γ^* must also remain unchanged. But this implies that the γ_i must be, *on average*, reduced.[22] This suggests a complementarity between those metrics if the NPMs are primarily used to mitigate externality problems across divisions. In contrast, the literature that analyzes the leading indicator function of NPMs typically finds that the financial and nonfinancial metrics are substitutes (e.g., Sliwka 2002). This suggests a way of empirically testing the alternative demands for the use of NPMs.

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[20] If $I = 0$ and $\Gamma = \Gamma^{**} = 1/3$, then the cutoffs in (11) degenerate to $\theta_b^o(\theta_s, \Gamma^{**}) = \theta_s$ and similarly for $\theta_s^o(\theta_b, \Gamma^{**}) = \theta_b$. Hence, the implementation will be fully efficient.

[21] Proposition 3 suggests the stronger result that the greater the investment opportunity the larger the optimal implementation bonus. For example, assume that $C(I) = (c/2)I^2$. Then we can show that for $\forall c \geq \hat{c}$, $\partial\Gamma/\partial c < 0$, where $\hat{c}$ is large enough to assure that (12) continues to hold.

III. LEARNING-BY-DOING

While the preceding model captures a variety of settings such as investments in capital assets or the hiring of specialized staff, its single-period nature prevents us from addressing dynamic issues associated with relationship-specific investments. We therefore next consider a two-period variation of the base model that drops investments in capital assets but incorporates learning effects. Specifically, if the joint project has been implemented in the first period, then the two divisions learn to carry out future (joint) projects more efficiently. Intuitively, one would then expect division managers to become more conciliatory when bargaining over a project in early periods so as to ensure that they realize these learning effects. As observed by Hadlock and Lewis (2003), such forward-looking bargaining behavior also constitutes a specific investment in the ongoing relationship. Two questions now arise: (1) how should the period-1 implementation bonuses be adjusted to provide the managers with the right incentives to implement projects efficiently and thereby invest in learning; (2) how does learning affect the *evolution* of bonuses over time.[23]

In this two-period model, each agent observes his personal disutility parameter z_i before contracting. Agent i's disutility associated with exerting effort of a_{it} in period t is $v_i(a_{it}, z_i) = z_i d_i(a_{it})$, with added subscripts for periods $t = 1, 2$. We assume that the z_i's and $d_i(\cdot)$ functions are time-invariant so as to focus on learning effects related to the joint projects. Division s's relevant cost of implementing the project in period 2 is $(\theta_{s2} - \ell_s q_1)$ and division b's period-2 relevant project-specific revenue is $(\theta_{b2} + \ell_b q_1)$. The learning parameters ℓ_i are assumed to be positive and commonly known. As before, divisional cost and revenue types θ_{it} are random transitory shocks, independently and uniformly distributed (i.i.d.) over $[0,1]$ for $i = s, b$ and $t = 1, 2$. Let $\ell = (\ell_s, \ell_b)$, $L = \ell_s + \ell_b$ and $\theta_t = (\theta_{st}, \theta_{bt})$. There is no discounting.

The deviations from first-best project implementation in Section II were a result of the principal using a single instrument, Γ, to trade off *ex ante* capital-investment and *ex post* implementation efficiency. In the current two-period setting, the principal again cares about implementation and investment (here, in learning) but now she has more than one instrument at her disposal, as the implementation bonuses can be set differently in each period. We therefore ask whether the sealed-bid mechanism, augmented with appropriate periodic implementation bonuses, can yield the first-best payoff to the principal. To that end, we begin by sketching the first-best solution period-by-period.

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[22] We use the qualifier "on average" because the Unraveling Property requires a regularity condition in order to pin down the relation between the adverse selection problem regarding the general-purpose effort and the individual γ_i's.

[23] Hadlock and Lewis (2003) also consider repeated bargaining where an exchange in an earlier period affects the value of subsequent transactions. However, they do not consider the role of a third-party budget breaker such as our principal. Baiman and Rajan (1998) consider learning effects in a dynamic agency setting, but with complete contracting.

Consider first the project implementation problem in period 2. The first-best project implementation rule in period 2 for any q_1 is given by:

$$q_2^{fb}(\theta_2, \ell, q_1) = 1, \text{ if and only if } \theta_{b2} \geq \theta_{b2}^{fb}(\theta_{s2}, \ell, q_1) \equiv \theta_{s2} - Lq_1. \tag{20}$$

In period 1, the firm takes into account the anticipated benefits associated with the learning effects ℓ created by the period-1 project implementation. Thus:

$$q_1^{fb}(\theta_1, \ell) = 1, \text{ if and only if } \theta_{b1} \geq \theta_{b1}^{fb}(\theta_{s1}, \ell) \equiv \theta_{s1} - \Delta^{fb}(\ell). \tag{21}$$

Here, $\Delta^{fb}(\ell)$ denotes the expected firm-wide period-2 benefit from learning-by-doing in period 1 as given by:

$$\Delta^{fb}(\ell) \equiv M_2^{fb}(\ell, q_1 = 1) - M_2^{fb}(\ell, q_1 = 0)$$

with $M_2^{fb}(\ell, q_1) \equiv E_{\theta_2}[\max\{0, \theta_{b2} - \theta_{s2} + Lq_1\}]$ as the expected firm-wide period-2 gains from project implementation conditional on q_1.

Now consider the delegation regime with the following sequence of events.

Date 1. The agents privately observe their respective z_i's.

Date 2. The owner publicly offers each of the agents a menu of two-period contracts: $S = \{\alpha_{i1}(z, \ell), \beta_{i1}(z, \ell), \gamma_{i1}(z, \ell), \alpha_{i2}^k(z, \ell), \beta_{i2}^k(z, \ell), \gamma_{i2}^k(z, \ell)\}$, for $i = s,b$ and $k = 0,1$. The first subscript refers to the division and the second refers to the period. Note that all contract parameters are contingent on the learning parameters ℓ; the superscript $k = q_1$ indicates that period-2 contract parameters may also be contingent on the period-1 project implementation decision.

Date 3. The agents report $\tilde{z} = (\tilde{z}_s, \tilde{z}_b)$. If they accept the contract, they commit not to quit during either period 1 or 2, for any subsequent cost or revenue realizations (θ_1, θ_2).

Date 4. Each agent chooses his effort a_{i1}.

Date 5. Each agent i privately observes his cost or revenue realization, θ_{i1}.

Date 6. The agents submit a sealed bid and ask, σ_{i1}. If $\sigma_{b1} \geq \sigma_{s1}$, then $q_1 = 1$ and $t_1 = (\sigma_{s1} + \sigma_{b1})/2$; otherwise $q_1 = t_1 = 0$.

Date 7. At the beginning of period 2, each agent chooses his effort a_{i2}.

Date 8. Agent i privately observes θ_{i2}.

Date 9. The agents again submit a sealed bid and ask, σ_{i2}. If $\sigma_{b2} \geq \sigma_{s2}$, then $q_2 = 1$ and $t_2 = (\sigma_{s2} + \sigma_{b2})/2$; otherwise $q_2 = t_2 = 0$. The agents are compensated and the game concludes.

The commonly available information is $\omega_1 = \{S, \tilde{z}\}$ at period-1 bargaining and $\omega_2 = \{\omega_1, q_1\}$ at period-2 bargaining. Notice that both the principal and the division managers commit to the two-period contracts that, by assumption, cannot be renegotiated. The principal can therefore, without loss of generality, postpone compensation payments until the end of period 2.

We next analyze the delegation scheme by proceeding backward. The contract slope coefficients $\beta_{it}(\cdot)$ will be solely determined by the general-purpose agency problems that are assumed time-invariant; thus in what follows we will take those slope coefficients as given by $\beta_{it}(\cdot) = \beta_i^*(z_i)$, $t = 1,2$. The period-2 Bayesian-Nash equilibrium in divisional bidding strategies is given by:

$$\sigma_{s2}(\theta_{s2}|\omega_2) \in \arg\max_{\sigma} E_{\theta_{b2}}$$
$$\left[\beta_s^*(z_s)\left(\frac{\sigma + \sigma_{b2}(\theta_{b2}|\omega_2)}{2} - \theta_{s2} + \frac{\gamma_{s2}}{\beta_s^*(z_s)} + \ell_s q_1\right) q_2(\sigma, \sigma_{b2}(\theta_{b2}|\omega_2))\right],$$

$$\sigma_{b2}(\theta_{b2}|\omega_2) \in \arg\max_{\sigma} E_{\theta_{s2}}$$
$$\left[\beta_b^*(z_b)\left(\theta_{b2} - \frac{\sigma_{s2}(\theta_{s2}|\omega_2) + \sigma}{2} + \frac{\gamma_{b2}}{\beta_b^*(z_b)} + \ell_b q_1\right) q_2(\sigma_{s2}(\theta_{s2}|\omega_2), \sigma)\right].$$

Each agent incorporates his anticipated payoff from learning-by-doing into his period-1 bidding strategy. Let the expected period-2 continuation payoff for, say, agent s given q_1 be denoted by:

$$V_{s2}(q_1, \ell, S) \equiv \beta_s^*(z_s)E_{\theta_2}\left\{\left[t_2(\cdot) - \theta_{s2} + \ell_s q_1 + \frac{\gamma_{s2}}{\beta_s^*(z_s)}\right] q_2(\cdot)\right\}.$$

Agent b's continuation payoff $V_{b2}(q_2, 1, S)$ is derived analogously. As we show in the proof of Proposition 4 below, symmetry of the bargaining protocol implies that:

$$\frac{V_{s2}(q_1,\ell, S)}{\beta_s^*(z_s)} = \frac{V_{b2}(q_1, \ell, S)}{\beta_b^*(z_b)} \equiv \hat{V}_2(q_1, \ell, S),$$

so that $\hat{V}_2(q_1, \ell, S)$ equals each agent's expected period-2 continuation payoff, scaled by his incentive weight. We denote by Δ the expected increase in each agent's period-2 continuation payoff (scaled by $\beta_i^*(z_i)$) as a consequence of the project being implemented in period 1, that is:

$$\Delta(\ell, S) \equiv \hat{V}_2(q_1 = 1, \ell, S) - \hat{V}_2(q_1 = 0, \ell, S).$$

Agent i's incremental expected period-2 compensation from having $q_1 = 1$ thus equals $\beta_i^*(z_i)\Delta(\ell, S)$. Using the above, the period-1 equilibrium bidding strategies can be represented as:

$$\sigma_{s1}(\theta_{s1}|\omega_1) \in \arg\max_{\sigma} E_{\theta_{b1}}$$
$$\left[\beta_s^*(z_s)\left(\frac{\sigma + \sigma_{b1}(\theta_{b1}|\omega_1)}{2} - \theta_{s1} + \frac{\gamma_{s1}}{\beta_s^*(z_s)} + \Delta(\ell, S)\right) q_1(\sigma, \sigma_{b1}(\theta_{b1}|\omega_1))\right],$$

$$\sigma_{b1}(\theta_{b1}|\omega_1) \in \arg\max_{\sigma} E_{\theta_{s1}}$$
$$\left[\beta_b^*(z_b)\left(\theta_{b1} - \frac{\sigma_{s1}(\theta_{s1}|\omega_1) + \sigma}{2} + \frac{\gamma_{b1}}{\beta_b^*(z_b)} + \Delta(\ell, S)\right) q_1(\sigma_{s1}(\theta_{s1}|\omega_1), \sigma)\right].$$

Note that, given our assumption of full commitment, Δ and period-1 (scaled) implementation bonuses serve as substitutes in mediating the agents' bargaining in period 1. Furthermore, as shown in the proof of Proposition 4, an Unraveling Property similar to Lemma 4 also holds in the learning-by-doing setting. With learning effects, only the respective sums of the periodic aggregate scaled implementation bonuses, i.e., $\Gamma_2^k \equiv \Sigma_{i=s,b}(\gamma_{i2}^k/\beta_i)$ and $\Gamma_1 \equiv \Sigma_{i=s,b}(\gamma_{i1}/\beta_i)$, and the *total* realized learning effects $Lq_1 \equiv (\ell_s + \ell_b)q_1$ matter for the implementation decisions and the principal's payoff.

The main result of this section now characterizes the implementation bonuses that ensure the first-best solution obtains in each period. To that end, let $\Gamma_1^{k*}(\ell) = \frac{\gamma_{s2}^{k*}(z, \ell)}{\beta_s^*(z_s)} + \frac{\gamma_{b2}^{k*}(z, \ell)}{\beta_b^*(z_b)}$, for $k = q_1 \in \{0,1\}$, and $\Gamma_1^*(\ell) = \frac{\gamma_{s1}^*(z, \ell)}{\beta_s^*(z_s)} + \frac{\gamma_{b1}^*(z, \ell)}{\beta_b^*(z_b)}$.

Proposition 4: With learning-by-doing in the two-period model, the principal realizes her first-best expected payoff by setting $\Gamma_1^*(\ell) = \frac{1 - L + \frac{1}{3}L^3}{3}$ and $\Gamma_2^{k*}(\ell) = \frac{1 + Lq_1}{3}$ for $k = q_1$. Thus, $\Gamma_1^*(\ell) < \Gamma^{**} = \frac{1}{3} = \Gamma_2^{0*}(\ell) < \Gamma_2^{1*}(\ell)$.

The optimal period-2 implementation bonus, $\Gamma_2^{k*}(\ell) = \frac{1 + Lq_1}{3}$, is contingent on the period-1 project implementation decision (i.e., whether learning effects were realized in period 1). If $q_1 = 0$ and the divisions do not learn anything going forward, then the optimal period-2 implementation bonus equals the optimal implementation bonus in the static setting studied earlier (ignoring investments in capital assets): $\Gamma_2^{0*}(\ell) = \Gamma^{**} = \frac{1}{3}$, To ensure conditionally efficient period-2 transactions upon observing $q_1 = 1$, however, the principal needs to *increase* Γ_2^1. The reason is that both agents understand that, in expectation, they are more efficient in period 2 given $q_1 = 1$, and therefore more likely to reach an agreement if they were to hold their bargaining strategies constant. By the logic of the double-auction mechanism, however, they will shade their bids even further. To counter this strategic bidding behavior, the principal needs to increase Γ_2^1.

Proposition 4 also implies that the period-1 implementation bonus is decreasing in L over its feasible range. Thus, the period-1 implementation bonus with learning is *lower* with than without learning effects ($\Gamma_1^* < \Gamma^{**} = \frac{1}{3}$). Furthermore, both period-2 implementation bonuses exceed the period-1 bonus. As mentioned before, $\Delta(\ell, S)$ and Γ_1 are substitutes in providing incentives for the agents to cooperate in period 1, where $\Delta(\ell, S)$ in turn is driven by the wedge $\Gamma_2^1 - \Gamma_2^0$. To ensure efficient period-2 implementation when learning effects have been realized (i.e., $q_1 = 1$), Γ_2^1 has to be increased to the point where $\Delta(\ell, S)$ is so large that the agents would have incentives to cooperate excessively in period 1. Hence, Γ_1 has to be adjusted downward to restore efficiency in period 1.

Thus, the optimal solution in Proposition 4 displays features of a "fast track" in variable compensation in the sense that early bonuses are associated with higher bonus payments in later periods. Put differently, there is positive serial correlation in bonus payments, which complements the theory and evidence in Bernhardt (1995) and Baker et al. (1994) on fast-tracks in promotions.[24] While in that earlier literature the driving force behind fast-tracking is the principal's gradual learning of a productivity type that is inherent to an agent, in our model fast-tracking arises solely as a result of path dependency. To illustrate, consider two firms, X and Y that are *ex ante* identical in that they are both fully described by the above setup with identical type distributions. Now suppose that in period 1 the division managers of Firm X have a more favorable draw from their cost and revenue type space than the managers of Firm Y, with the result that Firm X implements its period-1 project while Firm Y does not. As a result, the managers of Firm X earn their implementation bonuses (while those of Firm Y do not) *and* they will be offered a higher Γ_2^1 in period 2. That, in turn, increases the likelihood of another successful project implementation as compared with Firm Y.

IV. CONCLUSION

We have analyzed the role of nonfinancial performance measures (NPMs) in mitigating inefficiencies that arise as a result of interdivisional externalities. We view our results as complementary to the literature on the "leading indicator" function of NPMs. While that literature is predicated on an *intertemporal* externality problem, in our model the externality problem is *cross-sectional*, i.e., across divisions. The NPM-bonus in this model is an instrument that facilitates information sharing between privately informed agents: the higher the bonuses, the closer the agents will bid to their true valuations and, hence, the more information will be impounded in the implementation decision.

Our analysis generates a number of novel empirical predictions. First, we predict that larger upfront investment opportunities in capital assets should be associated with larger NPM-based bonuses, all else equal. To provide *ex ante* investment incentives, the principal commits to NPM-based bonuses that result in excessive project implementation *ex post*. Ittner and Larcker (2003) document excessive filing of patents, etc., which they interpret as a symptom of dysfunctional Balanced Scorecard models. Our results indicate that such *ex post* inefficiencies may not be the result of poor implementation, but the price firms pay for improved *ex ante* investment incentives. Second, we predict that *ex ante* more profitable joint projects should be associated with higher NPM-based bonuses. The intuition for this can be gleaned from a comparison of the two successive periods in the learning-by-doing setting of Section III. If the divisions have successfully completed an early project and, hence, have learned to be more efficient when working on a future project, then they will bargain more aggressively over that later project. In response, the principal optimally raises the period-2 NPM-based bonuses. In the context of our learning model, we therefore expect to see fast-tracking, i.e., positive serial correlation, of NPM-based bonuses in firms where learning plays a role.

We have made a number of simplifying assumptions, most prominently that the agents are risk-neutral and that no incentive weight is put on firm-wide profit. We did so in order to highlight the efficiency-enhancing role of NPMs. Our analysis suggests that NPMs and firm-wide profit sharing are substitutes in mitigating interdivisional externalities. In a model that allows both for risk-averse agents and firm-wide profit sharing, our analysis suggests that a demand for NPMs would remain. A cost of firm-wide profit sharing is excessive risk imposed on the agents whose compensation would be affected by the general business risk of the other division, in addition to the joint project-specific risk. The use of NPMs with firm-wide profit sharing allows the principal to reduce that risk, as these measures shield the agents from the general business risk of other divisions.

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[24] As shown in the proof of Proposition 4, given the optimal contract, the agent's incremental expected period-2 compensation from implementing the project in period 1 equals zero for $L = 0$ and is monotone increasing in L over the feasible range, as $\Delta(\ell, S^*) = L(3 + 2L - L^2)/6$. There we also show that L is bounded from above implicitly in that $L < 1/2$ by the requirement that the period-2 relevant supports must overlap. For any $L < 1/2$, it is easy to see that $d\Delta(\cdot)/dL > 0$ indeed holds.

APPENDIX
PROOFS

Proof of Lemma 1

Follows the proof of Lemma 1 in Baldenius (2000) and hence omitted.

Proof of Lemma 2

First, note that for any given I and Γ, we can always ignore two out of the six branches of the bargaining strategies in Lemma 1, either the bottom ones or the top ones. From direct inspection of the cutoffs in (11) it follows that one of two mutually exclusive cases obtains:[25]

- *Case A*: If $I + \Gamma \leq \frac{1}{3}$, then for $i = s,b$, $Q_i(\theta_i, \omega) < 1$ for all θ_i, and $Q_i(\theta_i, \omega) = 0$ for some θ_i,
- *Case B*: If $I + \Gamma > \frac{1}{3}$, then for $i = s,b$, $Q_i(\theta_i, \omega) > 0$ for all θ_i, and $Q_i(\theta_i, \omega) = 1$ for some θ_i.

We now prove for both Cases A and B, as denoted by superscripts "A" and "B."

Case A

Using $\Gamma \equiv \frac{\gamma_s}{\beta_s} + \frac{\gamma_b}{\beta_b}$ and rewriting (13) for Case A where $Q_i(\theta_i, \omega) < 1$ for all θ_i, and $Q_i(\theta_i, \omega) = 0$ for the least efficient θ_i's (i.e., high θ_s and low θ_b), we get:

$$Q^A(\omega) = \int_0^{\theta_s^o(1,\omega)} \int_{\theta_b^o(\theta_s,\omega)}^1 d\theta_b d\theta_s = \frac{9}{32}(1 + I + \Gamma)^2$$

$$M^A(\omega) = \int_0^{\theta_s^o(1,\omega)} \int_{\theta_b^o(\theta_s,\omega)}^1 [\theta_b - \theta_s + I] d\theta_b d\theta_s = \frac{9}{64}(1 + I + \Gamma)^2(1 + I - \Gamma).$$

Taking partial derivatives with respect to Γ gives:

$$\frac{\partial Q^A}{\partial \Gamma} = \frac{9}{16}(1 + I + \Gamma) > 0 \quad \forall \Gamma$$

$$\frac{\partial M^A}{\partial \Gamma} = \frac{9}{64}(1 + I + \Gamma)(1 + I - 3\Gamma) > 0 \text{ for } \Gamma \text{ sufficiently small.}$$

For future reference, one can show that: $\frac{\partial M^A}{\partial I} = Q^A + \frac{\partial M^A}{\partial \Gamma}$ (a proof is available from the authors on request).

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[25] We note that Lemma 2 would fail to hold if the primitive type supports were to differ. Recall that both θ_is are drawn uniformly from the unit interval in our model.

Case B

Rewriting (13) for Case B where $Q_i(\theta_i, \omega) > 0$ for all θ_i, and $Q_i(\theta_i, \omega) = 1$ for the most efficient θ_i's (i.e., low θ_s and high θ_b), we get:

$$Q^B(\omega) = \int_0^{\theta_s^o(0,\omega)} \int_0^1 d\theta_b d\theta_s + \int_{\theta_s^o(0,\omega)}^1 \int_{\theta_b^o(\theta_s,\omega)}^1 d\theta_b d\theta_s = \frac{1}{32}[7 + 30(I + \Gamma) - 9(I + \Gamma)^2].$$

Taking the partial derivative with respect to Γ yields:

$$\frac{\partial Q^B}{\partial I} = \frac{\partial Q^B}{\partial \Gamma} = \frac{3}{16}[5 - 3(I + \Gamma)], \tag{22}$$

which is positive by (12).

We now turn to the expected contribution margin under Case B:

$$M^B(\omega) = \int_0^{\theta_s^o(0,\omega)} \int_0^1 [\theta_b - \theta_s + I] d\theta_b d\theta_s + \int_{\theta_s^o(0,\omega)}^1 \int_{\theta_b^o(\theta_s,\omega)}^1 [\theta_b - \theta_s + I] d\theta_b d\theta_s$$

$$= \frac{9}{64}(1 + I + \Gamma)^2(1 + I - \Gamma) - \frac{1}{96}(1 + 3I - 3\Gamma)[3(I + \Gamma) - 1]^2.$$

Taking the derivative of $M^B(\omega)$ with respect to Γ gives:

$$\frac{\partial M^B}{\partial \Gamma} = \frac{3}{64}(5 - 3(I + \Gamma))(1 + I - 3\Gamma), \tag{23}$$

which, given (12), is positive for Γ sufficiently small. This completes the proof.

Finally, as with Case A, $\frac{\partial M^B}{\partial I} = Q^B + \frac{\partial M^B}{\partial \Gamma}$ (a proof is available from the authors on request).

Proof of Lemma 3

For either Case $k = A,B$, the investment problem from the viewpoint of agent s is, generically, to choose $I(\Gamma)$ so as to maximize $\hat{V}_s^k(\Gamma, I) - C(I)$ over all I, where $\hat{V}_s^k(\Gamma, I)$ denotes his expected investment return under Case k (as stated in detail below). The first-order condition for agent s's investment problem is:

$$\frac{\partial}{\partial I}\hat{V}_s^k(\Gamma, I(\Gamma)) - C'(I(\Gamma)) = 0. \tag{24}$$

By revealed preference (Edlin and Shannon 1998), a sufficient condition for $I'(\Gamma) > 0$ is that $(\partial^2/\partial I \partial \Gamma)\hat{V}_s^k(\Gamma, I) > 0$.

Case A

Agent *s*'s total investment return under Case A equals:

$$\hat{V}_s^A(\Gamma, I) = \int_0^{\theta_s^o(1,\omega)} \int_{\theta_b^o(\theta_s,\omega)}^1 [t(\theta, \omega) - \theta_s + I + \Gamma_s] d\theta_b d\theta_s,$$

with $\Gamma_i \equiv \gamma_i/\beta_i$, $i = s,b$. Thus:

$$\begin{aligned}&\frac{\partial}{\partial I} \hat{V}_s^A(\Gamma, I)\\ &= \left(1 + \frac{dt}{dI}\right) Q^A(I(\Gamma), \Gamma) - \frac{d\theta_b^o(\theta_s, \omega)}{dI} \int_0^{\theta_s^o(1,\omega)} \left[\left(\frac{\sigma_s(\theta_s, \omega) + \sigma_b(\theta_b^o(\theta_s, \omega), \omega)}{2}\right)\right.\\ &\quad \left. - \theta_s + I + \Gamma_s\right] d\theta_s,\end{aligned}$$

which after several simplifying steps yields $(\partial/\partial I)\hat{V}_s^A(\Gamma, I) = \frac{3}{4}Q^A(\Gamma, I)$, as in (16) (i.e., the $D(\cdot)$ function as defined in (16) is identically equal to zero in Case A). Thus, $(\partial^2/\partial I \partial\Gamma)\hat{V}_s^A(\Gamma, I) > 0$, if and only if $Q^A(I, \Gamma)$ is increasing in Γ. This, however, was shown in Lemma 2.

Case B

Agent *s*'s total investment return under Case B equals $\hat{V}_s^B(\Gamma, I) = \int_0^{\theta_s^o(0,\omega)} \int_0^1 [t(\theta, \omega) - \theta_s + I + \Gamma_s] d\theta_b d\theta_s + \int_{\theta_s^o(0,\omega)}^1 \int_{\theta_b^o(\theta,\omega)}^1 [t(\theta, \omega) - \theta_s + I + \Gamma_s] d\theta_b d\theta_s$. Taking the derivative with respect to I and simplifying yields the marginal investment return to agent s as stated in (16) for Case B:

$$\frac{\partial}{\partial I} \hat{V}_s^B(\Gamma, I) = \frac{3}{4} Q^B(\Gamma, I) - \frac{1}{16} [3(I + \Gamma) - 1],$$

i.e., $D(\cdot) = \frac{1}{16} [3(I + \Gamma) - 1] > 0$ in Case B. Again applying a revealed preference argument, we find that:

$$\frac{\partial^2}{\partial I \partial \Gamma} \hat{V}_s^B(\Gamma, I) = \frac{3}{64} [11 - 9(I + \Gamma)] > 0,$$

where the inequality holds by (12).

Thus, we have shown that $\Gamma(\Gamma) > 0$ for both Cases A and B.

Proof of Lemma 4

Follows the discussion in the main text and hence omitted.

Proof of Proposition 1

We begin by characterizing the contract coefficients required for any incentive-compatible and individually rational contract. Building on the discussion in the main text, the agents will earn informational rents only with respect to the effort choices, a_i, but not with respect to the investment and implementation decisions. The surplus created by the project can be extracted by the principal at no cost because the agents have no private information about θ at Date 3, the time of contracting, and they commit to stay with the firm for any subsequent realization of θ.

A standard revelation mechanism therefore results in second-best effort levels satisfying (18), with the agents earning informational rents as given in (17). Agent i will choose the second-best effort level $a_i^*(z_i)$ if and only if (19) is satisfied. The fixed salaries $\alpha_i^*(z_i)$ can then be chosen so as to extract the entire expected surplus arising from the investment and implementation decisions from the agents and leave them only with their informational rent $U_i(z_i)$. Last, the principal chooses $\Gamma^*(z)$ to solve the program:

$$\max_{\Gamma} \pi(\Gamma) \equiv M(\Gamma, I(\Gamma)) - C(I(\Gamma)),$$

subject to:

$$I(\Gamma) \in \operatorname{argmax}_I\{\hat{V}_s^k(I, \Gamma) - C(I)\},$$

with k indexing Cases A or B. Note that there is a degree of freedom in choosing the individual $\gamma_i^*(z)$: for any $(\beta_s^*(z_s), \beta_b^*(z_b))$ as determined by the earlier effort choice problems, there exist a one-dimensional family of solutions $\{\gamma_s, \gamma_b(\beta_s^*(z_s), \beta_b^*(z_b), \gamma_s)\}$ such that:

$$\frac{\gamma_s}{\beta_s^*(z_s)} + \frac{\gamma_b(\beta_s^*(z_s), \beta_b^*(z_b), \gamma_s)}{\beta_b^*(z_b)} \equiv \Gamma^*.$$

To prove Proposition 1, start with some contract $S^o = (\alpha^o(z), \beta^o(z), \Gamma(z) \equiv 0)$. Without loss of generality, take this "null contract" to be incentive compatible with regard to the agents' second-best effort choices, i.e., $\beta_i^o(z_i) = \beta_i^*(z_i)$. Also, assume that the fixed salaries were chosen optimally conditional on $\beta_i^*(z_i)$ and $\Gamma = 0$. Note that with $\Gamma = 0$ we have the problem analyzed by Chatterjee and Samuelson (1983) in which only Case A obtains.

Holding the $\beta_i^*(z_i)$'s constant, we now argue that the principal's payoff will increase if Γ is raised above zero. Holding $\beta_i^*(z_i)$ fixed, we only need to focus on the change of the project-related firm-wide surplus because the principal can fully extract the latter by adjusting the α_i's. Note in particular that at $\Gamma = 0$, $\hat{V}_s^A(I(0), 0) \equiv \frac{1}{2} M^A(I(0), 0)$ and thus $\frac{\partial}{\partial I} \hat{V}_s^A(I(0), 0) = \frac{1}{2} \frac{\partial}{\partial I} M^A(I(0), 0)$, by symmetry of the bargaining protocol: in the absence of implementation bonuses, the sum of the divisional managers' trading payoffs, scaled by their respective bonus coefficients β_i, precisely equals the firm-wide contribution margin. Therefore, at $\Gamma = 0$:

$$\begin{aligned}\pi'(0) &= \frac{\partial}{\partial \Gamma} M^A(I(0), 0) + \left[\frac{\partial}{\partial I} M^A(I(0), 0) - C'(I(0))\right] I'(0) \\ &= \frac{\partial}{\partial \Gamma} M^A(I(0), 0) + \left[2 \frac{\partial}{\partial I} \hat{V}_s^A(I(0), 0) - C'(I(0))\right] I'(0).\end{aligned}$$

By agent s's first-order investment condition, $(\partial/\partial I)\hat{V}_s^A(I(0), 0) - C'(I(0)) = 0$. Moreover, $I'(\Gamma) > 0$ for all Γ, by Lemma 3. Hence, $\pi'(0) > 0$ if $(\partial/\partial\Gamma)M(I(0), 0) > 0$, which was shown in Lemma 2. This concludes the proof of Proposition 1.

Proof of Proposition 2

As a useful prerequisite we first prove the following property:

Claim A1: Let $Y^* \equiv \Gamma^* + I(\Gamma^*)$. Then, $Y^* \geq \frac{1}{3}$, that is, Case B always obtains at the optimal Γ^*.

Proof: The firm's first-order condition describing the optimal total scaled implementation bonus Γ^* (generically, for any of the two cases, A and B) is:

$$\frac{\partial}{\partial\Gamma}M(\Gamma^*, I(\Gamma^*)) + \left[\frac{\partial}{\partial I}M(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*))\right] I'(\Gamma^*) = 0. \tag{25}$$

Since $I'(\Gamma) \geq 0$ for all Γ by Lemma 3, we have:

$$Sign\left[\frac{\partial}{\partial\Gamma}M(\Gamma^*, I(\Gamma^*))\right] = -Sign\left[\frac{\partial}{\partial I}M(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*))\right].$$

Suppose that, contrary to our claim, $Y^* < \frac{1}{3}$ with $Y^* \equiv \Gamma^* + I(\Gamma^*)$, i.e., Case A were to obtain. Using the identity from Lemma 2:

$$\frac{\partial}{\partial I}M^A(\cdot) \equiv Q^A(\cdot) + \frac{\partial}{\partial\Gamma}M^A(\cdot),$$

together with agent s's investment condition in (16) for Case A, it follows that:

$$\frac{\partial}{\partial\Gamma}M^A(\Gamma^*, I(\Gamma^*)) < 0 < \frac{\partial}{\partial I}M^A(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*)).$$

Now, since:

$$\frac{\partial}{\partial\Gamma}M^A(\Gamma, I) = \frac{9}{64}(1 + I + \Gamma)(1 + I - 3\Gamma),$$

it follows that $(\partial/\partial\Gamma)M^A(\Gamma^*, I(\Gamma^*)) < 0$ implies $\Gamma^* > \dfrac{1 + I(\Gamma^*)}{3}$. This contradicts the maintained assumption that Case A prevails, i.e., $Y^* \equiv \Gamma^* + I(\Gamma^*) < \frac{1}{3}$. Thus, by Lemma 2, we conclude that Case B must obtain at the optimal Γ^*.

Following the discussion in the main text, the contract parameters $(\alpha^*(z), \beta^*(z))$ are uniquely determined by the agency problem related to eliciting second-best effort inputs, $a_i^*(z_i)$ from the agents. Given the optimal $\beta^*(z)$, the principal chooses the $\gamma_i^*(z_i)$ so as to optimally coordinate the agents' investment and implementation decisions. Because of the previously discussed degree of freedom in choosing the individual $\gamma_i^*(z_i)$'s, we perform a change of variables and let the principal optimize over Γ.

Based on the preceding discussion, the profit-maximizing Γ^* is the solution of the optimality condition in (25) for Case B:

$$\frac{\partial}{\partial \Gamma} M^B(\Gamma^*, I(\Gamma^*)) + \left[\frac{\partial}{\partial I} M^B(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*))\right] I'(\Gamma^*) = 0, \tag{26}$$

subject to the constraint that agent s will choose his investment $I(\Gamma)$ according to the first-order condition given in (16):

$$\frac{3}{4} Q^B(I(\Gamma), \Gamma) - D(I(\Gamma), \Gamma) - C'(I(\Gamma)) = 0, \tag{27}$$

where $D(I(\Gamma), \Gamma) \equiv \frac{1}{16}[3(\Gamma + I(\Gamma)) - 1]$. By Lemma 3, (26) implies that:

$$Sign\left[\frac{\partial}{\partial \Gamma} M^B(\Gamma^*, I(\Gamma^*))\right] = -Sign\left[\frac{\partial}{\partial I} M^B(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*))\right].$$

Now suppose that, contrary to our claim, $(\partial/\partial\Gamma)M^B(\Gamma^*, I(\Gamma^*)) \geq 0$ while $(\partial/\partial I)M^B(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*)) \leq 0$. Using the identity from Lemma 2, $\frac{\partial}{\partial I} M^B(\cdot) \equiv Q^B(\cdot) + \frac{\partial}{\partial \Gamma} M^B(\cdot)$, we find that:

$$\begin{aligned}\frac{\partial}{\partial I} M^B(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*)) &= \frac{\partial}{\partial \Gamma} M^B(\Gamma^*, I(\Gamma^*)) + Q^B(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*)) \\ &\geq \frac{3}{4} Q^B(\Gamma^*, I(\Gamma^*)) - D(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*)) \\ &= 0.\end{aligned}$$

The inequality holds because $((\partial/\partial\Gamma)M^B(\cdot), Q^B(\cdot), D(\cdot))$ are all positive under our maintained assumptions, and the last equality simply restates agent s's investment condition (27) at $\Gamma = \Gamma^*$. We therefore obtain a contradiction and conclude that:

$$\frac{\partial}{\partial \Gamma} M^B(\Gamma^*, I(\Gamma^*)) \leq 0 \leq \frac{\partial}{\partial I} M^B(\Gamma^*, I(\Gamma^*)) - C'(I(\Gamma^*)).$$

Proof of Corollary 1

The proof of Corollary 1 follows from Claim A1 in the proof of Proposition 2.

Proof of Proposition 3

In the absence of an investment opportunity ($I = 0$ because $C'(0) \rightarrow \infty$), the optimal implementation bonus, denoted Γ^{**}, achieves first-best trading efficiency in that $(\partial/\partial\Gamma)M(\Gamma^{**}, 0) = 0$. (Note that at Γ^{**} there is no difference between Cases A and B.)

Recall that with agent s's investment opportunity, the first-order condition characterizing the optimal Γ^* is given in (26). As shown in the proof of Proposition 2, this implies that $(\partial/\partial\Gamma)M^B(\Gamma^*, I(\Gamma^*)) < 0$. As additional preliminaries, note that:

$$\frac{\partial^2}{\partial\Gamma^2}M^B(\Gamma, I) = -\frac{9}{32}[3 - (I + 3\Gamma)] < 0$$

by (12), and:

$$\frac{\partial^2}{\partial\Gamma\partial I}M^B(\Gamma, I) = \frac{3}{32}[1 - 3I + 3\Gamma],$$

so that $(\partial^2/\partial\Gamma\partial I)M^B(\Gamma^o, I = 0) > 0$, also by (12). Now, given that $C'(0) = 0$, $I(\Gamma = 0) > 0$, and suppose that the then optimal Γ^* were less than Γ^{**}, contrary to our claim. Then, using the above conditions:

$$\frac{\partial}{\partial\Gamma}M^B(\Gamma^*, I(\Gamma^*)) \geq \frac{\partial}{\partial\Gamma}M^B(\Gamma^*, 0) \geq \frac{\partial}{\partial\Gamma}M^B(\Gamma^{**}, 0) = 0,$$

a contradiction. Hence, we conclude that $\Gamma^* > \Gamma^{**}$.

Proof of Proposition 4

We begin with the first-best solution for the two-period model with learning effects. As noted in the text, the efficient implementation rule in period 2, conditional on q_1 is characterized by (20), while the first-best period-1 implementation rule is characterized by (21), where $\Delta^{fb}(\ell)$ denotes the expected firm-wide period-2 benefit from learning-by-doing in period 1. In order to compute $\Delta^{fb}(\ell)$, note that the expected period-2 firm-wide gain from trade conditional on q_1 equals:

$$\begin{aligned} M_2^{fb}(L, q_1) &\equiv E_{\theta_2}[\max\{0, \theta_{b2} - \theta_{s2} + Lq_1\}] \\ &= \int_0^{Lq_1}\int_0^1 (\theta_{b2} - \theta_{s2} + Lq_1)d\theta_{b2}d\theta_{s2} + \int_{Lq_1}^{1}\int_{\theta_{s2}-Lq_1}^{1} (\theta_{b2} - \theta_{s2} + Lq_1)d\theta_{b2}d\theta_{s2} \\ &= \frac{1}{6}[(1 + Lq_1)^3 - 2(Lq_1)^3], \end{aligned}$$

It therefore follows that:

$$\Delta^{fb}(\ell) \equiv M_2^{fb}(L, q_1 = 1) - M_2^{fb}(L, q_1 = 0) = \frac{L}{2}\left(1 + L - \frac{L^2}{3}\right).$$

Now consider the delegation problem. Since the agency problem is assumed to be time-invariant, we can apply similar arguments as in the single-period case and take as given the second-best bonus coefficients $\beta_{i1}(\cdot) = \beta_{i2}^k(\cdot) = \beta_i^*(z_i)$, for any $i = s,b$ and $k = 0,1$. To avoid clutter we will suppress the argument z_i and simply write β_i^*. Using the same approach as in Section II, yields the following solutions for the bidding strategies:

$$\sigma_{s2}(\theta_{s2}|\omega) =$$

$$\begin{cases} \dfrac{1 - 3\left(\ell_s q_1 + \dfrac{\gamma^k_{s2}}{\beta^*_s}\right) + 9\left(\ell_b q_1 + \dfrac{\gamma^k_{b2}}{\beta^*_b}\right)}{12}, \\ \quad \theta_{s2} \leq \theta^o_{s2}(0, \omega_2) \\ \sigma^o_{s2}(\theta_{s2}|\omega_2) = \dfrac{3 - 9\left(\ell_s q_1 + \dfrac{\gamma^k_{s2}}{\beta^*_s}\right) + 3\left(\ell_b q_1 + \dfrac{\gamma^k_{b2}}{\beta^*_b}\right) + 8\theta_{s2}}{12}, \\ \quad \theta_{s2} \in (\theta^o_{s2}(0, \omega_2, \theta^o_{s2}(1, \omega_2)) \\ \theta_s - \left(\ell_b q_1 + \dfrac{\gamma^k_{s2}}{\beta^*_b}\right), \\ \quad \theta_{s2} \geq \theta^o_{s2}(1, \omega_2) \end{cases}$$

$$\sigma_{b2}(\theta_{b2}|\omega_2) =$$

$$\begin{cases} \dfrac{11 - 9\left(\ell_s q_1 + \dfrac{\gamma^k_{s2}}{\beta^*_s}\right) + 3\left(\ell_b q_1 + \dfrac{\gamma^k_{b2}}{\beta^*_b}\right)}{12}, \\ \quad \theta_{b2} \geq \theta^o_{b2}(1, \omega_2) \\ \sigma^o_{b2}(\theta_{b2}|\omega_2) = \dfrac{1 - 3\left(\ell_s q_1 + \dfrac{\gamma^k_{s2}}{\beta^*_s}\right) + 9\left(\ell_b q_1 + \dfrac{\gamma^k_{b2}}{\beta^*_b}\right) + 8\theta_{b2}}{12}, \\ \quad \theta_{b2} \in (\theta^o_{b2}(0, \omega_2), \theta^o_{b2}(1, \omega_2)) \\ \theta_b + \left(\ell_b q_1 + \dfrac{\gamma^k_{b2}}{\beta^*_b}\right), \\ \quad \theta_{b2} \leq \theta^o_{b2}(0, \omega_2) \end{cases}$$

with $k = q_1$, $\omega_2 = \{\omega_1, q_1\}$, $\theta^o_{s2}(\theta_{b2}, \omega) = \theta_{2b} - \dfrac{1}{4}\left[1 - 3\left(Lq_1 + \dfrac{\gamma^k_{s2}}{\beta^*_s} + \dfrac{\gamma^k_{b2}}{\beta^*_b}\right)\right]$ and $\theta^o_{b2}(\theta_{s2}, \omega) = \theta_{s2} + \dfrac{1}{4}\left[1 - 3\left(Lq_1 + \dfrac{\gamma^k_{s2}}{\beta^*_s} + \dfrac{\gamma^k_{b2}}{\beta^*_b}\right)\right]$. For given q_1, the implementation will thus occur in period 2 if and only if:

$$\theta_{b2} \geq \theta^o_{b2}(\theta_{s2}, \omega_2) = \theta_{s2} + \frac{1 - 3(Lq_1 + \Gamma^k_2)}{4}, \quad k = q_1 \tag{28}$$

where $\Gamma^k_2 = \sum\limits_{i=s,b} (\gamma^k_{i2}/\beta^*_i)$. The expected period-2 continuation payoff for agent s given q_1 is denoted by:

$$V_{s2}(q_1, \ell, S) = \beta^*_s E_{\theta_2}\left\{\left[t_2(\cdot) - \theta_{s2} + \ell_s q_1 + \frac{\gamma^k_{s2}}{\beta^*_s}\right] q_2(\cdot)\right\}.$$

To compute this continuation payoff, note that similar arguments as in the proof of Claim A1 apply to show that Case B holds and therefore, for $i = s,b$, $Q_i(\theta_i, \omega) > 0$ for all θ_i, and $Q_i(\theta_i, \omega) = 1$ for some θ_i. Hence, *ex ante* there are four possible situations to consider:

$$(Q_{s2}(\theta_{s2}, \omega) = 1, 1 > Q_{b2}(\theta_{b2}, \omega) > 0), (Q_{s2}(\theta_{s2}, \omega) = 1, Q_{b2}(\theta_{b2}, \omega) = 1),$$

$$(0 < Q_{s2}(\theta_{s2}, \omega) > 1, 1 > 1Q_{b2}(\theta_{b2}, \omega) > 0), (0 < Q_{s2}(\theta_{s2}, \omega) < 1, Q_{b2}(\theta_{b2}, \omega) = 1).$$

The four cases are reflected in the following:

$$\begin{aligned}
&V_{s2}(q_1, \ell, S)\\
&= \beta_s^* \Bigg\{ \int_0^{\theta_{s2}^o(0,\omega_2)} \int_0^{\theta_{b2}^o(1,\omega_2)} \left(\frac{\sigma_{s2}(\theta_{s2}^o(0, \omega_2)|\omega_2) + \sigma_{b2}(\theta_{b2}|\omega_2)}{2} - \theta_{s2} + \ell_s q_1 + \frac{\gamma_{s2}^k}{\beta_s^*} \right)\\
&\quad \times d\theta_{b2} d\theta_{s2}\\
&\quad + \int_0^{\theta_{s2}^o(0,\omega_2)} \int_{\theta_{b2}(1,\omega_2)}^{1} \left(\frac{\sigma_{s2}(\theta_{s2}^o(0, \omega_2|\omega_2) + \sigma_{b2}(\theta_{b2}^o(1, \omega_2)|\omega_2)}{2} - \theta_{s2} + \ell_s q_1 + \frac{\gamma_{s2}^k}{\beta_s^*} \right)\\
&\quad \times d\theta_{b2} d\theta_{s2}\\
&\quad + \int_{\theta_{s2}^o(0,\omega_2)}^{1} \int_{\theta_{b2}^o(\theta_{s2},\omega)}^{\theta_{b2}^o(1,\omega)} \left(\frac{\sigma_{s2}(\theta_{s2}|\omega_2) + \sigma_{b2}(\theta_{b2}|\omega_2)}{2} - \theta_{s2} + \ell_s q_1 + \frac{\gamma_{s2}^k}{\beta_s^*} \right) d\theta_{b2} d\theta_{s2}\\
&\quad + \int_{\theta_{s2}^o(0,\omega_2)}^{1} \int_{\theta_{b2}(1,\omega_2)}^{1} \left(\frac{\sigma_{s2}(\theta_{s2}|\omega_2) + \sigma_{b2}(\theta_{b2}^o(1, \omega_2)|\omega_2)}{2} - \theta_{s2} + \ell_s q_1 + \frac{\gamma_{s2}^k}{\beta_s^*} \right) d\theta_{b2} d\theta_{s2} \Bigg\}\\
&= \frac{\beta_s^*}{384} [25 + 87(\Gamma_2^k + Lq_1) + 99(\Gamma_2^k + Lq_1)^2 - 27(\Gamma_2^k + Lq_1)^3].
\end{aligned}$$

Proceeding similarly for agent b's period-2 payoff $V_{b2}(q_1, \ell, S)$ establishes the symmetry of the bargaining protocol, that is:

$$\hat{V}_2(q_1, \ell, S) \equiv \frac{V_{s2}(q_1, \ell, S)}{\beta_s^*} = \frac{V_{b2}(q_1, \ell, S)}{\beta_b^*}.$$

As in the text, denote by $\Delta(\ell, S)$ the expected increase in this (scaled) period-2 continuation payoff as a consequence of the transaction being completed in the first period:

$$\begin{aligned}
\Delta(\ell, S) &\equiv \hat{V}_2(q_1 = 1, \ell, \Gamma_2^1) - \hat{V}_2(q_1 = 0, \ell, \Gamma_2^0)\\
&= \frac{1}{384} \{87(\Gamma_2^1 + L - \Gamma_2^0) + 99[(\Gamma_2^1 + L)^2 - (\Gamma_2^0)^2] - 27[(\Gamma_2^1 + L)^3\\
&\quad - (\Gamma_2^0)^3]\}. \qquad (29)
\end{aligned}$$

The resulting interior solutions for the period-1 bidding strategies are:[26]

$$\sigma_{s1}(\theta_{s1}|\omega_1) = \frac{3 - 9\frac{\gamma_{s1}}{\beta_b^*} + 3\frac{\gamma_{b1}}{\beta_b^*} - 6\Delta(\ell, \mathcal{S}) + 8\theta_{s1}}{12},$$

$$\sigma_{b1}(\theta_{b1}|\omega_1) = \frac{1 - 3\frac{\gamma_{s1}}{\beta_b^*} + 9\frac{\gamma_{b1}}{\beta_b^*} + 6\Delta(\ell, \mathcal{S}) + 8\theta_{b1}}{12}. \qquad (30)$$

From (30) it follows that $q_1(\theta_1, \omega_1) = 1$ if and only if:

$$\theta_{b1} \geq \theta_{b1}^o(\theta_{s1}, \omega_1) \equiv \theta_{s1} + \frac{1 - 3[\Gamma_1 + 2\Delta(\ell, \mathcal{S})]}{4}. \qquad (31)$$

The first set of results of Proposition 4 follow from a comparison of (31) with (21) and (28) with (20). In order to assure that the relevant valuation supports overlap, we require that $1 - L - \Gamma > 0$ for $(\Gamma_1^*(\ell), \Gamma_2^{k*}(\ell))$. This implies that $L < \frac{1}{2}$. The result that $\Gamma_1^*(\ell) < \Gamma^{**} = \Gamma_2^{0*}(\ell) < \Gamma_2^{1*}(\ell)$ then follows from the fact that $L < \frac{1}{2}$. Finally, substituting the optimal weighted scaled compensation parameters into (29) gives $\Delta(\ell, \mathcal{S}^*) = L(3 + 2L - L^2)/6$, as stated in footnote 24.

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[26] We suppress here the boundary conditions to avoid clutter.

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An Experimental Investigation of the Positive and Negative Effects of Mutual Observation

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ABSTRACT: We use two experiments to test predictions about the positive and negative impacts of allowing analysts to revise their forecasts in light of the consensus forecasts. We find that such mutual observation not only facilitates information aggregation, but also induces free riding, which offsets the benefits of information aggregation unless incentives for accuracy are high. In our second experiment, we find that participants acting as investors anticipate these effects in the consensus and adjust their own forecasts accordingly. Our study demonstrates that the positive and negative effects of mutual observation are more complex than typically portrayed in the debate about analyst independence, and provides a framework that can be used in future research on the interactive nature of public forecasting.

Keywords: *forecasting; herding; free riding; group interaction; incentives.*

Data Availability: *The experimental data are available for purposes of replication. Please contact the authors.*

I. INTRODUCTION

Experimental research has largely ignored how the opportunity of financial analysts to observe each other's opinions might influence the forecasts they produce. While the communication allowed by "mutual observation" could facilitate information aggregation, the financial press has tended to ignore this potential benefit, arguing instead

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that mutual observation keeps analysts from conducting their own independent analyses (Opdyke and Asinof 2001; Glassman 2001; Dreman 2002; Lynch 2002; Hulbert 2002; Ritholtz 2004; Shiller 2005). Such concerns are not unjustified; economists argue that individual incentives can make free riding on the consensus rational (Kargin 2003), and the work of psychologists suggests that people have a natural tendency to be miscalibrated in group settings, which causes them to irrationally overweight what they learn from others in the group (Einhorn and Hogarth 1975; Dawes 1979; Glaeser and Sunstein 2007; Seybert and Bloomfield 2009). Moreover, because information aggregation, free riding, and miscalibration all increase the redundancy among analysts' forecasts, there is the additional concern that mutual observation will cause investors to overestimate the informativeness of the consensus forecast (Maines 1990, 1996; Soll 1999).

We develop a framework for predicting the positive and negative effects of mutual observation, and conduct two experiments designed to test those predictions. Our framework details four processes that give rise to a consensus forecast: *extraction* of information from a set of data; *analysis* of this information; *publication* of forecasters' opinions; and *observation* of the published forecasts (when possible). We derive alternative hypotheses by making different assumptions about the imperfections of extraction and analysis, which our baseline model assumes are perfect. Two alternative models assume that analysis is perfect, but that extraction is constrained by either cognitive limitations or effort aversion. A fourth model assumes that analyses are miscalibrated because they place too much weight on the consensus. Thus, our framework allows us to separate the various reasons why mutual observation might lead to greater consensus extremity and identify whether such increases can be expected to enhance or harm the informational efficiency of the consensus, rather than simply assuming that greater consensus extremity is *prima facie* evidence of irrationality.

In our first experiment, we present groups of four forecasters with a residual-income forecasting task. We give all forecasters the same data set; however, the data set is sufficiently complex that cognitive limitations, effort aversion, and miscalibration are all plausible. To examine the effect of mutual observation, we manipulate whether forecasters can revise their forecasts in light of the consensus. We also manipulate incentives for accuracy because mutual observation should induce less free riding when these incentives are high.

Our results indicate that mutual observation facilitates information aggregation among forecasters, as if they are each able to extract only a subset of the available information from the common data set. As information gets aggregated, forecasts become less dispersed around the resulting consensus, and the consensus tends to deviate more from the prior belief (that is, it becomes more "extreme" relative to the prior). We also find that higher incentives increase the amount of information that is aggregated, as if individual forecasters engage in less data extraction when they are able to observe the consensus and have only moderate incentives to be accurate. We find no evidence of systematic miscalibration; on average, forecasters do not rely on the consensus too much or too little. Instead, the evidence from Experiment 1 suggests characterizing forecasters as effort-averse Bayesians, who alternatively use mutual observation as a substitute for or a supplement to their own data extraction efforts, depending on their incentives for accuracy.

Given that mutual observation dramatically alters the statistical properties of forecasts, we conduct a second experiment to see whether these differences alter how useful forecasts are to others. In this second experiment, we present a new group of participants (whom we call "investors") with the forecasts generated in Experiment 1 and ask them to make the same assessments as in Experiment 1 with similar incentives for accuracy. We tell the investors whether the analysts they observe from Experiment 1 were allowed to observe the consensus, but we do not provide investors with the fundamental information that was available to the analysts. Standard economic theory assumes that investors will fully anticipate the effects of the analysts' ability (or inability) to observe the consensus. However, prior experimental research finds that people often overestimate the information contained in redundant signals (Maines 1990; Soll 1999), suggesting that investors may overreact to the high-extremity and low-dispersion forecasts generated by analysts in the observation condition by treating those forecasts as if they were independent.

When investors know that observation was not permitted, they place greater weight on the forecasts of analysts who deviated more from the prior belief (i.e., the analysts who were relatively more extreme). Because the more extreme analysts were indeed more accurate, this weighting makes investor beliefs more accurate than the analyst consensus. When investors know that observation was permitted, they weight all forecasts similarly regardless of extremity, as if the investors understand that these analysts have already aggregated their information, leaving little basis on which to make additional systematic adjustments. Thus, we find strong evidence that investors do indeed account for the redundancy that mutual observation introduces into analysts' forecasts.

Overall, our results demonstrate that free riding can reduce the informativeness of the consensus forecast, bolstering the importance of professional standards requiring analysts to use due diligence when conducting their research (CFA Institute 2005) and supporting actions that help to ensure that analysts have sufficient incentives for accuracy tied to the research, recommendations, and forecasts they produce. While we find little evidence of miscalibration or irrational group polarization, such effects are far more likely to arise in richer contexts. Our study provides a framework that can be used for future research on these possibilities.

In Section II, we derive directional hypotheses from various assumptions about forecaster behavior and discuss how those hypotheses relate to extant research in group psychology and economics. We describe the details and results of Experiment 1 in Section III. We describe the details and results of Experiment 2 in Section IV, and Section V concludes.

II. THEORY AND HYPOTHESES

Background

Analysts have been widely criticized for failing to provide their own independent analyses of fundamental information (Opdyke and Asinof 2001; Glassman 2001; Dreman 2002; Lynch 2002; Hulbert 2002; Ritholtz 2004). Some writers have complained that the ability of analysts to learn the consensus "at the touch of a button ... seems to discourage many analysts from straying very far from the consensus" (Dorfman and McGough 1993). Others writers caution investors to be "skeptical of the experts ... [because] if a few top analysts start buying a story, then practically every analyst buys the story" (Glassman 2001). Cote and Goodstein (1999) argue that mimicry can mislead investors, who might otherwise assume that analysts "have a reasonable and adequate basis for [their] recommendations and actions, supported by appropriate research and investigation" as required by the CFA Standards of Professional Conduct (CFA Institute 2005). However, most of these complaints ignore the fact that mutual observation should also facilitate information aggregation, much as market trades do (Surowiecki 2004).

Economic research on mimicry (typically called "herding") tends to focus on the rational explanations for such behavior, such as informational cascades that arise when the information in others' forecasts overwhelm one's own information (Welch 1992; Bikhchandani et al. 1992), the need to protect one's reputation by staying near the consensus (e.g., Scharfstein and Stein 1990; Trueman 1994; Zwiebel 1995; Hong et al. 2000), and less so on the incentives analysts might have to free ride on the consensus (Kargin 2003). Psychological research focuses instead on tendencies for individuals to be miscalibrated and overweight the opinions of others in group settings (Glaeser and Sunstein 2007). Little research has directly tested the validity of these concerns in the domain of forecasting earnings, however, as archival studies typically lack a control group in which mimicry is impossible, and experimental research in accounting to date has focused on forecaster behavior in individual settings.[1]

Hypotheses Development

Our goal in this study is to examine the effect of mutual observation by carefully identifying and separating the various influences of information aggregation, free riding, and miscalibration. We begin by modeling the process by which Bayesian-rational agents would generate individual and consensus forecasts. Figure 1, Panel A uses rectangles to depict the inputs and outputs of the forecasting model and uses lines to indicate the various processes. Agents begin with two inputs: a prior belief about future earnings and a data set from which they can extract information to update their priors. An extraction process determines the data each agent actually considers, and an analysis process determines how agents interpret the data in light of their priors. These processes result in an output, which is a forecast for each individual agent. A publication process then impounds each new forecast into a consensus forecast and, when mutual observation is permitted, an observation process makes the consensus available as an additional source of information.

To construct hypotheses, we begin by assuming data extraction and analysis are perfect; we then relax these standard assumptions to generate alternative hypotheses. We assume, in turn, that extraction is limited by time or ability; that extraction is limited by effort aversion; and finally, that individuals fall prey to psychological biases as they observe others' forecasts. For expositional purposes, we couch our discussion in terms of a generic forecasting task in which analysts must determine the time-series process that is most likely to have led to the data they observe. We also assume that these forecasters share the same prior belief about that underlying process (which, for simplicity, is a belief that each potential time-series process is equally likely). Last, we assume that the forecasters have access to the same noisy data and that all noise terms are normally distributed.

We are primarily interested in how mutual observation affects three key properties of the consensus: dispersion, extremity, and accuracy. Dispersion reflects the degree to which individual forecasts deviate from the consensus they jointly produce. Extremity measures the degree to which the resulting consensus deviates from the prior consensus belief. Accuracy reflects the degree to which all available information is efficiently impounded into the consensus.

Perfect Bayesian Rationality

If forecasters perfectly extract all available information from the fundamental data and analyze the resulting information as rational Bayesians, then each agent's individual forecast will be a weighted average of the common prior belief about earnings and the earnings indicated by their analysis of the fundamental data. The weight on each of these inputs is directly proportional to a ratio of the precision of the two pieces of information to be combined. Therefore, more informative fundamental data will lead to forecasts that are, on

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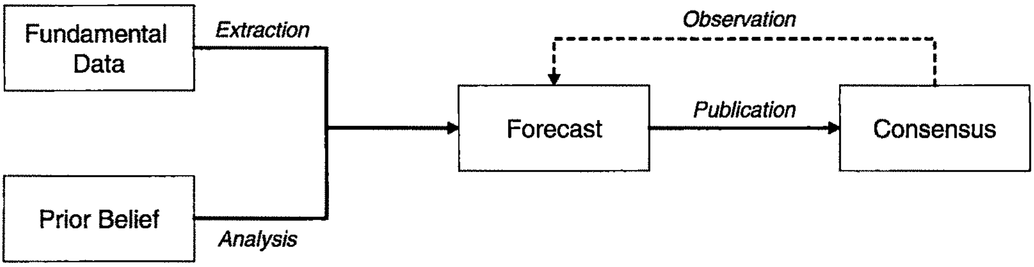
[1] For example, researchers have investigated whether forecasters understand the time-series properties of earnings (Maines and Hand 1996), are affected by the form and format of disclosures (Maines et al. 1997; Sedor 2002; Krische 2005), or respond to motivational incentives (Hunton and McEwen 1997).

FIGURE 1
A Summary of How Mutual Observation Affects Behavior

Panel A: Information Processing with Mutual Observation



Panel B: Summary of Predicted Effects

Model of Forecaster Behavior	Source of Information Loss	Effect of Mutual Observation on the Properties of the Consensus		
		Dispersion	**Extremity**	**Accuracy**
Perfect Bayesian Rationality (H0)	None	None	None	None
Limited Extraction (H1)	Limited Extraction: Exogenous	Lowers	Increases	Improves
Effort Aversion (H2)	Limited Extraction: Endogenous	Lowers	Increases more with high incentives	Improves more with high incentives
Group Psychology (H3)	Over-Weighting of Observed Information	Lowers	Increases	Worsens

Panel A of this figure provides a simple model of forecasting with mutual observation. Extracting information from a set of fundamental data provides an analyst with information that is combined with the analyst's prior belief to produce a forecast. A publication process impounds that forecast into the consensus. When mutual observation is possible, the prevailing consensus is available to each analyst and so acts as an alternative source of information that can affect each analyst's forecast.

Panel B summarizes how mutual observation will influence properties of the consensus under four models of forecaster behavior. Consensus dispersion is measured relative to the mean of the individual forecasts. Consensus extremity is measured relative to the common prior. Consensus accuracy is a measure of informational efficiency and so reflects the difference between the consensus and the optimal assessment given the common prior and the fundamental data.

average, more extreme relative to the prior belief about earnings. For instance, completely uninformative data would lead to forecasts exactly equal to the prior belief, and completely informative data, by providing forecasters with certainty about the correct time-series process, would swamp the information in forecasters' priors and lead to relatively extreme revisions.

However, because the forecasters share identical priors, have access to the same fundamental data, and because they analyze that data identically (as there is only one Bayesian-rational process), there is no forecaster disagreement—all forecasts are identical. As a result, mutual observation has no effect because there is nothing to learn from observing what others believe. This leads to our baseline prediction:

H0: (Baseline) Mutual observation has no effect on the dispersion, expected extremity, or expected accuracy of the consensus forecast.

Bayesian Rationality with Exogenous Limitations on Data Extraction

We now relax our initial assumption that data extraction is complete and perfect and assume instead that forecasters are constrained by idiosyncratic technological or cognitive limitations such that they extract only a subset of the available data. Like most analytical models (e.g., Grossman and Stiglitz 1980), this first deviation from perfect Bayesian rationality relaxes the assumption of perfect information without making any alternative assumptions about Bayesian rationality (though we will allow for non-Bayesian reasoning later). Incomplete data extraction means that forecasters will be differentially informed by the same data (as in Kim and Verrecchia 1997). Note, however, that the degree of extraction is exogenous for each individual and is not a choice variable that might be influenced by incentives.[2]

In this context, where Bayesian forecasters become differentially informed when individually extracting information from a data set, mutual observation has exactly one effect: it facilitates information aggregation. As a result, mutual observation naturally reduces dispersion around the consensus, as forecasters adjust toward one another. Facilitating information aggregation also makes the consensus more accurate and extreme. Recall that forecasters who extract more information from the common data set provide forecasts that, on average, deviate more from the prior belief (i.e., are more extreme relative to the prior). Because these more extreme forecasters, having extracted more information, are (appropriately) more confident, they stand to learn less from viewing the opinions of others. As a result, mutual observation leads the consensus to become more extreme because the most extreme forecasters remain rather extreme, while the least extreme (and least informed) adjust their beliefs significantly more in response to seeing the consensus. This process (which effectively weights more extreme and informed forecasts more heavily) causes the consensus to be more extreme and informed than if it were a simple average of forecasters who worked on their own. This leads to our second hypothesis:

H1: (Exogenous Limits to Extraction) Mutual observation reduces forecast dispersion and increases consensus extremity and accuracy.

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[2] One reason most models assume imperfect data extraction, rather than imperfect analysis, is that imperfect extraction leads to straightforward predictions, while imperfect analysis leads to any number of predictions (because there are so many possible deviations from rational analysis). Moreover, imperfect analysis in an interactive setting presents a host of difficult questions about whether people are aware of their biases, or of other peoples' biases, etc.

Bayesian Rationality with Endogenous Limitations on Data Extraction

Next, we assume that the data extraction is limited because forecasters find data extraction to be effortful, time consuming, or unpleasant, and therefore extract more data only when the expected benefit of doing so outweighs the cost. Such an assumption is standard in economic models, and reasonable from a psychological perspective as well (Libby and Lipe 1992), because data extraction decisions are typically consciously controlled, and therefore subject to cost-benefit analyses.

As when limits on extraction were exogenous, mutual observation will provide each individual analyst with a new source of information. However, because the impact of every additional data point decreases with the amount of data already collected, the availability of a new source of information also reduces forecasters' incentives to extract fundamental data themselves. As a result, the beneficial effect of facilitating information aggregation is at least partly offset by the tendency of mutual observation to encourage free riding. Note that observing the consensus did not lead to free-riding in either of the prior two cases because forecasters either process information perfectly (H0) or with error but without regard to a cost-benefit analysis (H1).

Assuming that limits on data extraction are endogenous does not change the prediction that mutual observation will reduce dispersion, as forecasters will still adjust toward one another, regardless of free riding. However, we are unable to predict whether mutual observation will increase or decrease the information content of the consensus forecast, because we do not know whether the benefit of facilitating information aggregation will be sufficient to offset the loss of information that comes with free riding. Instead, we predict that the effect of mutual observation will vary with incentives. High incentives do not affect the degree of information aggregation (because we are assuming that analysis is perfect), but will counter the tendency of mutual aggregation to induce free riding.[3] As a result, this set of assumptions suggests that mutual observation will increase accuracy and extremity more when incentives are high than when they are low:

H2: (Endogenous Limits to Extraction) Mutual observation decreases forecast dispersion, and increases consensus extremity and accuracy more when incentives are high than when they are low.

Agreement Driven by Group Psychology Rather than Bayesian Inference

Our final model assumes an imperfection in the analysis process. Prior research on hidden-profile tasks (Stasser and Titus 1985, 2003) suggests that people in group decision-making settings underestimate the influence that they have on each other and therefore overestimate the information content of other forecasts. In hidden-profile experiments, each member of a group is given some information relevant to a decision (which is often to identify the culprit in a murder mystery). Some pieces of information are held by only one member, while others are held more broadly. A robust result in such experiments is that group decisions are too heavily influenced by information held by many members, and too little influenced by information held by only one member—even when members are later given access to all pieces of information (Postmes et al. 2001).

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[3] If extracting information from the consensus requires effort, then higher (lower) incentives will enhance (detract from) the ability of mutual observation to facilitate information aggregation, leading to an even stronger interaction between incentives and observation.

In our setting, a tendency to overweight the observed consensus would arise if, for example, forecasters were to irrationally anchor on the early consensus when deciding their own forecast or, similarly, if they were to censor their own opinion, opting instead to exhibit agreement with the prevailing group consensus. In such cases, mutual observation would also lead to an increase in consensus extremity relative to the prior, as in the previous hypotheses (see Figure 1, Panel B). To see how, assume that one forecaster was selected at random to publish his/her forecast first, and the other three simply mimicked the first forecast (which is the simplest and most extreme version of overweighting). In that case, the consensus forecast would be exactly as extreme and as accurate as the forecast of an *individual* who worked on his/her own. By leading to this type of mimicry, mutual observation would generate a consensus that is more extreme and less accurate than the consensus arising from four forecasters working independently. The no-observation consensus is more accurate because averaging of independent forecasts cancels out random errors, and is less extreme whenever forecasts deviate from the prior belief in different directions. The negative effects of mimicry would be further exacerbated if forecasters are also subject to "groupthink" (Janis 1982) and attitude polarization (Myers and Lamm 1976; Isenberg 1986), social pressures that lead individuals with moderate opinions to become more extreme when they interact in small groups. We therefore hypothesize the following:

H3: (Group Psychology) Mutual observation reduces forecast dispersion, and it reduces consensus accuracy by making the consensus too extreme.

In the following section, we describe an experiment that we conducted to determine which of the above models is most descriptive of the way in which mutual observation affects properties of the consensus.

III. EXPERIMENT 1

Method

Design Overview

The experiment involved 68 M.B.A. students at a top-ranked business school. Participants made two forecasts for each of eight fictitious companies (16 total forecasts) using a residual income model (RIM). Participants were randomly assigned to 17 groups of four participants each. Using a computerized network, ten of the groups were allowed within-group mutual observation, as we explain below, while the remaining seven groups were forced to make independent decisions without observing other participants' forecasts. Within both settings, half of the groups saw the eight firms in one order, and the other half saw the firms in the opposite order. The experiment, therefore, utilizes two between-group factors (Observation and Order). Within-groups, we manipulate the incentives that participants face for accuracy by having them make assessments for firms across a variety of levels of recent abnormal performance. We explain our manipulations in more detail below.

The Task

To examine the advantages and disadvantages of mutual observation in an objective setting, we presented participants with an earnings forecasting task within a residual-income valuation framework (Frankel and Lee 1998; Dechow et al. 1999). Such models determine value-to-book ratios using projections of abnormal earnings, defined as return on equity (ROE) less the cost of capital. We simulate RIM processes by assuming that abnormal earnings revert to a cost of capital of 10 percent, with expected earnings next year being a fraction, ρ, of the current year's earnings. The rate of persistence is equally likely to be 95 percent (high persistence) or 65 percent (low persistence). Thus, $E[ROE_{t+1}|ROE_t] = 0.65(ROE_t) + 0.35(10 \text{ percent})$ when persistence is low, and $E[ROE_{t+1}|ROE_t] = 0.95(ROE_t) + 0.05(10 \text{ percent})$ when persistence is high. Actual earnings each period depends on this expectation and the realization of a noise term, which is distributed normally around zero with a standard deviation of four percentage points.

A rational Bayesian who observes a set of earnings realizations in this setting computes the probability of high persistence, which we refer to as α, by comparing the probability of observing each earnings number under high and low persistence. Because each comparison (even if only done intuitively) takes time and attention, we expect effort aversion to limit the number of comparisons participants will make when they view the financial benefit of another comparison to be less than its cost in time and mental effort.

We use α^* to denote the probability calculated using optimal Bayesian methods given all available data; α^* therefore serves as a measure of the diagnosticity of the available data. If the data are more diagnostic, then an optimal assessment will deviate more from the shared prior of 0.50. On average, limited extraction causes the consensus to fall between 0.50 and α^*. Thus, limited extraction results in a consensus that is not only less extreme (deviates less from 0.50), but also less accurate (because it causes the consensus to deviate more from α^*), as hypothesized in H1 and H2. In contrast, a tendency of individuals to be too extreme in responding to the opinions of others, because that behavior is not rooted in information aggregation, would increase expected extremity, but do so without an associated increase in accuracy (e.g., leading to an extreme consensus even when α^* is low), as hypothesized in H3.

Administration

All participants had received previous RIM training, either in a course on financial statement analysis or in a course on topics in financial markets. During each session, participants were situated in a single room at individual computer terminals, where they received instructions that were then reviewed orally by the experiment administrator before they were asked to make any decisions. The instructions explained that the participants would be assessing the time-series process governing earnings twice for each of eight fictitious firms (see Table 1). Performance for each firm was created by a random number generator, as described above, and participants were given all relevant information about the RIM model and data generation process.

For each firm, participants initially saw a screen that included a tabular display of the first six years of earnings, book value, and ROE (Figure 2, Panel A). The screen also included a graph of ROE for those years (Figure 2, Panel B). Based on this data, participants were asked to assess the probability that the firm's earnings were being generated with high persistence (α). Participants submitted their assessment of α by choosing a number between 0 and 100 from a drop-down menu. Given this probability assessment, the software automatically projected for the participant next-period earnings and ROE, as well as an appropriate current value-to-book ratio using the standard methods of residual-income valuation. Each of these projections was automatically displayed on the computer screen and updated immediately for any revision in the participant's assessment of α. Participants were allowed to revise their assessment (called their "tentative" assessment) as many times as they wanted, until they had clicked a button to transmit their "final" assessment.

After all four participants in a group had submitted their final individual assessment of α, actual earnings and ROE were then revealed for the year just forecasted. Participants

TABLE 1
Firm Information

	ROE History							Optimal		Quartile Rank	
Firm	2	3	4	5	6	7	8	Alpha	V/B	Diag.	Incentives
1.1	11.6	11.1	10.6	9.2	13.1	8	—	41.5%	0.86	1	1
1.2	11.6	11.1	10.6	9.2	13.1	8	14.1	36.5%	1.42	2	2
2.1	17.5	15.7	20.5	19.6	21.1	19.2	—	81.9%	5.62	3	4
2.2	17.5	15.7	20.5	19.6	21.1	19.2	21.2	89.8%	6.05	4	4
3.1	10.9	10.2	11.1	13.2	9.4	3.7	—	48.0%	0.63	1	1
3.2	10.9	10.2	11.1	13.2	9.4	3.7	17.2	17.8%	1.53	4	3
4.1	13.4	20.1	15.6	16.6	16.7	6	—	31.5%	0.80	2	1
4.2	13.4	20.1	15.6	16.6	16.7	6	12.4	23.2%	1.15	3	2
5.1	6.7	11.5	13.6	12.8	16.1	18.8	—	61.2%	3.17	2	3
5.2	6.7	11.5	13.6	12.8	16.1	18.8	22.8	80.3%	7.06	3	4
6.1	13.2	22.1	23.6	26.5	22	20.1	—	93.3%	5.16	4	4
6.2	13.2	22.1	23.6	26.5	22	20.1	15.3	89.2%	2.32	4	3
7.1	5.2	8.7	7.5	7.8	1.3	9	—	29.5%	0.94	2	1
7.2	5.2	8.7	7.5	7.8	1.3	9	15.1	27.3%	1.44	3	2
8.1	11.8	10.4	15.7	16.4	14	12.6	—	50.6%	1.31	1	2
8.2	11.8	10.4	15.7	16.4	14	12.6	16.6	56.0%	2.20	1	3

This table contains information about each of the firms used in the experiment. Each firm was analyzed for two rounds: once with a seven-period history and once with an eight-period history. All histories began with ROE = 10 percent, the cost of capital. Participants moved through the eight "firms" in numerical order, as indicated above, or in the reverse order. Alpha refers to the probability that abnormal earnings persist at a high rate (95 percent) rather than the low rate (65 percent). Optimal alpha is the statistical probability that alpha is high, given the ROE history. Optimal value-to-book measures the V/B ratio implied by the optimal alpha. Diagnosticity is determined by ranking the 16 events according to how far the optimal alpha is in absolute terms from the naïve prior of 50 percent. Incentive strength is determined by ranking the 16 events according to the absolute magnitude of residual income.

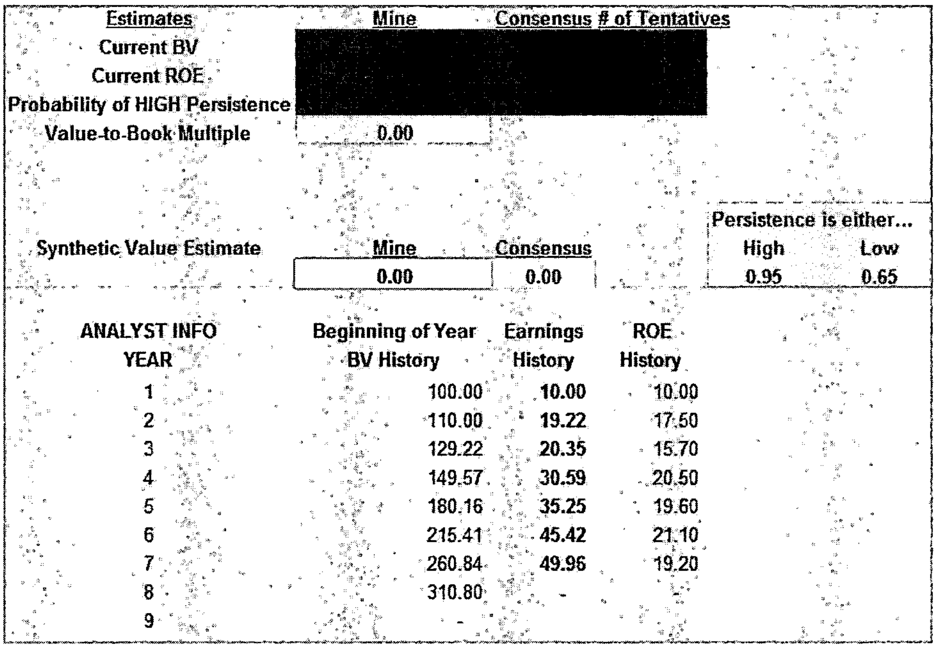
then made another assessment of α, now based on the original time-series plus one additional year of data. Upon completion of this second assessment, actual earnings and ROE for this second forecasted year were revealed, at which point the firm's true persistence level was also revealed along with firm value for both periods and how much the participants earned in those periods for their estimates (as we describe below). Participants then continued on to the next firm, repeating the same steps for each firm. Note that at no time were participants told what the optimal assessment of α was given the data that they saw, only whether high or low persistence had actually been used in generating a given firm's earnings.

Manipulating Observation

In our observation setting, participants were always able to see their group's current consensus estimate of α, computed as the mean of their individual assessments. Participants could see how many other (but not which) group members had submitted an estimate for inclusion in the consensus. When a participant submitted a tentative assessment or a revision, the consensus was updated to reflect this new information and the update was immediately relayed for all group members to see. The consensus always reflected the consensus of the most current forecasts. In our no-observation setting, participants received no

FIGURE 2
Screen Display

Panel A: Tabular Display of Financial Information



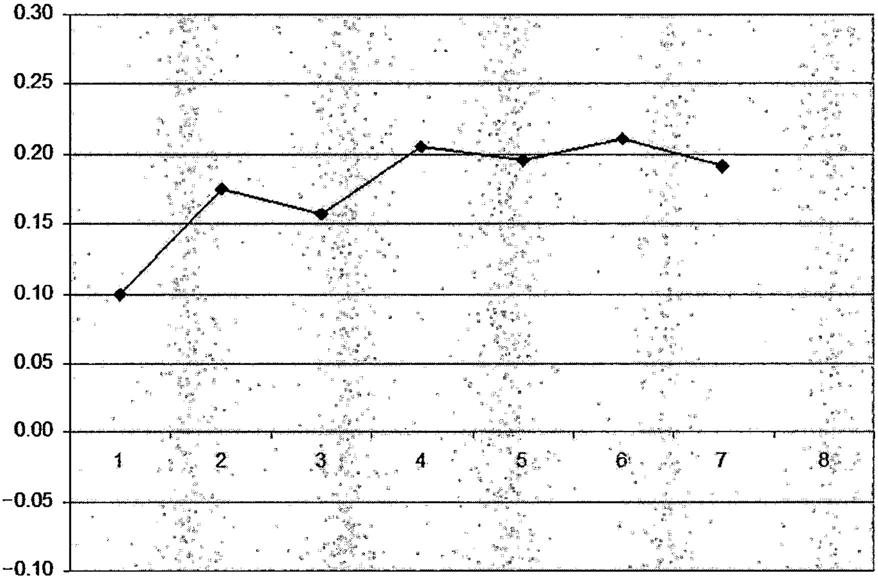
Estimates	Mine	Consensus	# of Tentatives
Current BV	[redacted]	[redacted]	[redacted]
Current ROE	[redacted]	[redacted]	[redacted]
Probability of HIGH Persistence	[redacted]	[redacted]	[redacted]
Value-to-Book Multiple	0.00		

Synthetic Value Estimate	Mine	Consensus
	0.00	0.00

Persistence is either...	
High	Low
0.95	0.65

ANALYST INFO YEAR	Beginning of Year BV History	Earnings History	ROE History
1	100.00	10.00	10.00
2	110.00	19.22	17.50
3	129.22	20.35	15.70
4	149.57	30.59	20.50
5	180.16	35.25	19.60
6	215.41	45.42	21.10
7	260.84	49.96	19.20
8	310.80	-	-
9	-		

Panel B: Graphical Display of Historical ROE



This figure contains snapshots of the information as displayed on the computer screen. ROE history was displayed both in tabular format and graphically.

information about the assessments of their fellow group members, but their task was identical in all other respects.

Manipulating Incentives for Accuracy

Participants' incentives are based on the accuracy of the value estimates derived from their probability estimates. We use a version of the Becker et al. (1964) device to ensure incentive compatibility. We first compute the "baseline" value of a firm with a 50 percent probability of high persistence. If the participant's value estimate is greater (less) than the baseline value, the participant buys (sells) one share at every price from the baseline value to their estimated value. Gains or losses on these trades were determined by the difference between the trade price and the true value (given the true level of persistence). This payment scheme is incentive-compatible because participants maximize their expected profit by accurately revealing their estimate; doing otherwise forces the participants to engage in trades they believe will be unprofitable or to miss an opportunity to engage in some profitable trades.

Our payment scheme also allows us to naturally manipulate the magnitude of participants' incentive to be accurate. When residual income in the most recent period is close to zero, persistence has little impact on the next observation (which is also expected to have residual income close to zero). In such cases, the values implied by high or low persistence will be relatively similar, so that the difference between what a participant makes from being right or loses from being wrong is relatively small—thereby, providing forecasters with only moderate incentives to correctly identify the persistence of the time-series. In contrast, when recent residual income is far from zero, persistence has a strong impact on expected residual income in the future (which is expected to be much closer to zero when persistence is low). Because the values implied by high or low persistence will be very different for these securities, the difference between what a participant makes from being right or loses from being wrong will be relatively large, providing forecasters with much stronger incentives to correctly identify the time-series.

To quantify the variability in our manipulation of accuracy incentives, we measure the difference in what an assessment of 100 would earn if persistence is high and what it would lose if persistence is low.[4] Using this measure of incentive strength, we see that the lowest three incentive quartiles are similar to one another but very different from the fourth quartile. Specifically, the average incentive strength of securities in Q1–Q3 is 6,990, but is 45,453 in Q4. Moreover, the gap between the highest incentive security in Q3 (19,015) and the lowest in Q4 (37,138) is quite large (18,123)—almost as large as the range spanned in Q1–Q3. For simplicity when presenting our results, we collapse the lowest three quartiles into one level (moderate incentives), to be compared to the fourth quartile (high incentives). However, our inferences are similar when analyses are conducted using a finer partition of incentive strength, such as quartiles.

In addition to the individual incentive, participants in both the observation and no-observation settings also received 10 percent of the gain or loss of the other participants in their group. We included this feature in the observation setting to ensure that participants did not believe they had an incentive to withhold information from the group (e.g., by delaying submissions) or to trick others (e.g., by entering misleading tentative assessments). We included this feature in the no-observation setting to avoid confounding observational learning with a difference in the incentive scheme.

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[4] Note that an assessment of zero would produce the same difference in gain or loss.

Gains and losses in laboratory dollars were converted to U.S. dollars by adding a constant to their laboratory dollar amount, and then converting with an exchange rate. Participants were then paid the greater of the calculated amount or $5. Neither the constant nor the exchange rate was revealed to participants to reduce the chances of risk-seeking behavior of participants who suspected they were close to receiving the minimum payment. Average compensation was about $20 per participant.

Controlling for Diagnosticity

Although we are primarily interested in how incentives affect forecaster behavior, firms with recent abnormal (normal) performance are also likely to have somewhat more (less) diagnostic time-series—because the most recent observation is, by definition, far from (close to) the cost of capital. Moreover, forecast errors are likely to be correlated with diagnosticity (Bloomfield et al. 2000). We, therefore, include a variable to control for the diagnosticity of each time-series. For consistency, we use a classification that is similar to the one for accuracy incentives. We classify the 16 events into two levels of diagnosticity: low (the absolute difference between the probability of high persistence and 50 percent is in the lowest three quartiles) or high (the absolute difference is in the highest quartile).[5] Inferences are similar when the analyses are performed using quartiles rather than binary classifications.

Results

Our hypotheses predict the effects of observation and incentives for accuracy on the dispersion, extremity, and accuracy of consensus forecasts. We begin by analyzing forecast dispersion, which we define for each group of forecasters as the sum of the absolute distance of the forecasts from the consensus. As predicted by all three alternative hypotheses, mean dispersion is substantially lower when observation is allowed, averaging 12.10 over all events with observation, compared to 21.93 without observation (see Figure 3, Panel A). To test the significance of this difference, we use a repeated-measures ANOVA, with between-group factors for observation and firm order and within-group factors for incentives and diagnosticity.[6] We find that observation has a statistically significant effect on dispersion ($p < 0.001$, one-tailed), providing clear evidence that forecasters are responding to one another and converging on an outcome. Thus, we strongly reject H0 (which hypothesizes no effect) in favor of any of the other three alternatives.[7]

Panel B of Figure 3 plots consensus extremity as a function of observation and incentives. Averaging over all events, observation increases extremity from 14.96 to 21.45, with the main effect of observation statistically significant ($p = 0.004$, one-tailed). Again, we are able to reject H0, which predicts no effect of observation on extremity. The results also provide support for H2 over H1 because H2 (which allows limitations to be endogenous) predicts an interaction between observation and incentives due to the effect of free riding, which reduces information extraction and so lowers expected consensus extremity. As predicted by H2, the interaction between observation and incentives is highly significant ($p = 0.008$). While observation greatly increases consensus extremity when forecasters have strong incentives for accuracy ($\mu_{\text{no obs}} = 18.48$ versus $\mu_{\text{obs}} = 30.44$; $p = 0.004$), observation has little effect on consensus extremity when forecasters have only moderate incentives for accuracy ($\mu_{\text{no obs}} = 13.78$ versus $\mu_{\text{obs}} = 18.45$; $p > 0.10$).

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[5] We use the absolute difference from 50 percent because, in a binary world, a 0 percent chance of high persistence is just as diagnostic as a 100 percent probability of high persistence. In contrast, a 50 percent probability of high persistence is completely non-diagnostic.

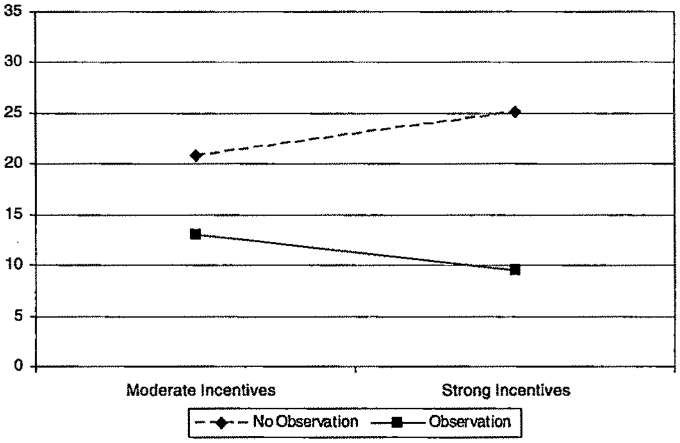
[6] We exclude any factor representing firm or year, as these were rarely significant either separately or in interaction with other variables and have little effect on the inferences of interest.

[7] The effect of observation on convergence of opinion is most pronounced when forecasters have strong incentives for accuracy ($p < 0.001$), indicating that forecasters devote greater effort to observation as their incentives for accuracy increase. This result suggests that extracting information from the group consensus may itself be an effortful process.

With respect to H2 versus H3, we find little evidence that miscalibration leads to excess extremity, as predicted by H3. On the contrary, consensus extremity does not deviate from optimal extremity when forecasters have moderate incentives for accuracy ($\mu_{\text{difference}} = 1.64$, $p = 0.231$), and the consensus tends to be ***insufficiently*** extreme, rather than too extreme, when incentives for accuracy are strong ($\mu_{\text{difference}} = -5.89$, $p = 0.026$).

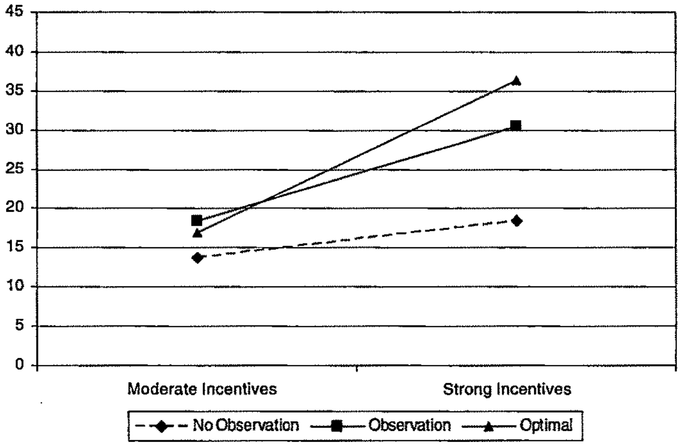
FIGURE 3
Forecast Properties Conditional on Observation and Incentive Strength

Panel A: Forecast Dispersion



Observation:	p < 0.001
Diag:	p = 0.710
Incentive:	p = 0.576
Obs x Diag:	p = 0.267
Obs x Incentive:	p < 0.001

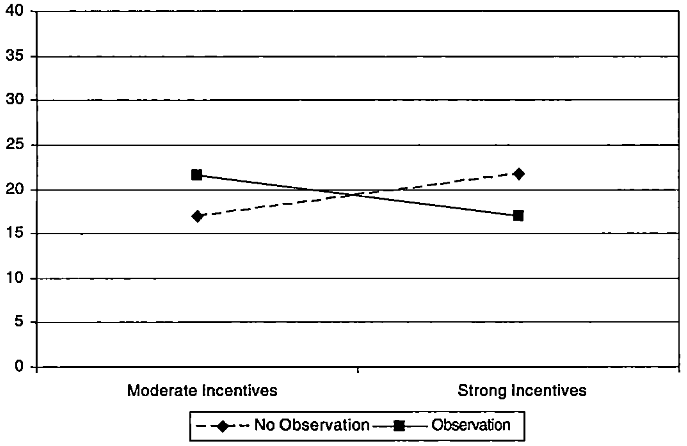
Panel B: Consensus Extremity



Observation:	p = 0.008
Diag:	p = 0.702
Incentive:	p < 0.001
Obs x Diag:	p = 0.153
Obs x Incentive:	p = 0.008

(*continued on next page*)

FIGURE 3 (continued)


Panel C: Consensus Error

Observation: p = 0.838
Diag: p < 0.001
Incentive: p < 0.001
Obs x Diag: p = 0.577
Obs x Incentive: p = 0.005

This figure reports consensus dispersion, extremity, and absolute error of participants' alpha estimates, conditional on whether mutual observation is allowed and whether incentives for accuracy are strong or moderate. Within-group forecast dispersion is measured as the absolute deviation of each forecast in a cohort from that cohort's mean (consensus) forecast. Consensus extremity measures the absolute deviation between the consensus forecast and 50 percent (the naïve prior). Consensus error measures the absolute deviation between the consensus forecast and the optimal alpha (as implied in the data series). Alpha refers to the probability that abnormal earnings persist at a high rate (95 percent) rather than the low rate (65 percent). No-observation groups consist of four individuals who submit their assessment of alpha without learning anything about the forecasts of their fellow group members. Observation groups consist of four individuals who have access to the current consensus forecast for their group prior to submitting their final forecast. To the right of each panel, we report two-tailed p-values from the full repeated-measures ANOVA described in the text.

Analysis of absolute errors further reinforces the predictive power of assuming endogenous limits to data extractions. Looking at the absolute error of the consensus, Panel C of Figure 3 shows an interaction between observation and incentives, which provides additional support for H2: observation is far more beneficial when incentives for accuracy are strong than when they are moderate ($p = 0.005$ for interaction).[8]

Overall, the results from Experiment 1 indicate that mutual observation affects the informativeness of the consensus through the countervailing effects of information aggregation and free riding, with the latter being suppressed the most when incentives for accuracy are the strongest. Supplementary analyses reinforce this interpretation. For example, an untabulated analysis of individual forecast accuracy shows that observation greatly reduces individual forecast errors when forecasters have strong incentives for accuracy ($\mu_{\text{no obs}} = 28.73$ versus $\mu_{\text{obs}} = 19.39$; $p = 0.011$), but not when those incentives are relatively low ($\mu_{\text{no obs}} = 27.59$ versus $\mu_{\text{obs}} = 25.53$; $p = 0.659$), consistent with the economic theory that the ability to observe others should not make an individual worse off, and may help. This interaction suggests that, when accuracy incentives are moderate, forecasters use observation as a *substitute* for individual effort, achieving similar levels of individual accuracy with less effort than if they had worked independently; when accuracy incentives are strong, forecasters use observation as a *supplement* to effort, dramatically improving their individual performance.

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[8] Follow-up analysis indicates that this interaction is driven largely by the increase in consensus accuracy that occurs as incentives increase in the observation condition ($p = 0.001$, one-tailed). The effect of incentives on accuracy is not statistically significant in the no-observation condition. Analysis of the other two simple effects provides weak evidence that observation harms consensus accuracy when incentives are moderate ($p = 0.044$, one-tailed) but improves consensus accuracy when incentives are strong ($p = 0.095$, one-tailed).

To summarize, the results from Experiment 1 provide strong support for H2, which is based on the assumption that forecasters are Bayesian rational, but face endogenous limitations on data extraction. We reject H0 because mutual observation reduces dispersion, indicating that data extraction is limited. We reject H1 because mutual observation increases consensus accuracy more when incentives are high than when they are low, showing that the limit to data extraction is a choice by forecasters, apparently subject to a cost-benefit analysis. We reject H3 because we find little evidence of systematic irrationality in forecasters' use of the consensus.

IV. EXPERIMENT 2

The results of Experiment 1 show that mutual observation dramatically changes the dispersion, extremity, and accuracy of analyst forecasts. We now examine whether investors account for these changes when they base their own assessments on analysts' reports. In our second experiment, we present the assessments generated in Experiment 1 to a group of student participants we call "investors." The investors, who are given incentives to be accurate, do not see the time-series information presented to the analysts. Our key manipulation is whether investors are presented with the assessments of analysts who were in our observation setting or in our no-observation setting.

Hypotheses

As in Experiment 1, we begin by deriving our predictions from economic theory before considering alternatives to rational behavior. The first key implication of economic theory is that investors, like analysts, can use the extremity of each forecast as an indication of its statistical precision. When analysts have worked independently, investors can replicate the positive effects of mutual observation by placing more weight on more extreme forecasts. This behavior would make investor forecasts more extreme and more accurate than the consensus forecasts they observe (which weights all four forecasts equally).

In contrast, when investors observe analyst forecasts that were generated in the presence of mutual observation, the consensus they see already reflects greater weight on the opinions of those analysts who were able to extract the most information out of the data. Therefore, investors in the observation condition can outperform the consensus only if they are able to *incrementally* improve upon the aggregation conducted by the analysts themselves. Because we see little reason for investors to be incrementally superior to analysts in aggregating individual forecasts, we make the following prediction:

> **H4:** Investor forecasts are more extreme and accurate than the consensus they observe in the no-observation setting, but not in the observation setting.

Psychological theory suggests some clear alternatives to H4. Maines (1990) found that individuals ignore the implications of forecast redundancy when assessing the expected accuracy of a consensus forecast, and Maines (1996) found that manipulating forecaster dependence did not alter how participants combined analyst forecasts together. If investors ignore forecast redundancy and treat analysts' forecasts in the observation setting as if they were produced independently (much as is argued by Glaeser and Sunstein [2007]), then in both conditions we will see investor forecasts that are more extreme than the consensus. This failure to account for redundancy would also cause investor forecasts to be more extreme, but less accurate, in the observation setting than the no-observation setting.

Another alternative hypothesis is suggested by Larrick and Soll (2006) and Soll and Larrick (2006). These papers show that people have poor intuitions about how to combine the opinions of others or to revise their own opinion in light of the opinions of others. In particular, people often choose from among a set of experts, rather than constructing a weighted average of the experts' opinions. Untabulated data from Experiment 1 indicates that *individual* analyst forecasts in the no-observation are more extreme but less accurate than individual analyst forecasts in the observation setting.[9] As a result, if investors in both of our settings simply choose to agree with a single analyst for any given firm, investors in the no-observation setting would tend to be more extreme but less accurate than investors in the observation setting.

Method

Experimental Design

The experiment involved 34 M.B.A. students at a top-ranked public business school. Participants were randomly assigned to one of two settings. Twenty individuals were assigned to observe the assessments produced in the observation setting of Experiment 1, and 14 individuals were assigned to observe the assessments produced in the no-observation setting of Experiment 1. Within each condition, we yoked two investor participants to each of the Experiment 1 analyst cohorts, meaning that those investors saw all of the final assessments of the cohort to whom they were yoked. Because firm order had little influence in Experiment 1, we used the same firm order for all participants in Experiment 2. The experiment uses a 2 (Observation Setting) × N (Analyst Cohort: 10 or 7) × 16 (Period) nested factorial design. The first two factors are manipulated between participants. The last factor is a within-participant repeated measure.

The Task

For each of the 16 periods, investors were shown the final assessments of the four analysts (identified as analysts A–D) to whom they were yoked, as shown in Figure 4. In addition to seeing the analysts' individual assessments of α, we also provided investors with the mean and median assessment of α as well as the payoff implications (both in tabular and graphical format) for agreeing with each of these assessments. We did not provide them with the fundamental information observed by the analysts. After reviewing this information for a given firm-period, investors were asked to make their own assessment of α. Unlike Experiment 1, our investor participants in Experiment 2 did not learn actual persistence for any of the firms.

Our two primary dependent variables are investor forecast extremity and investor forecast error, both of which we measure relative to the consensus that the investor observes. Specifically, relative forecast extremity measures the difference between the investor's assessment of alpha and the consensus estimate of the cohort to which the investor has been

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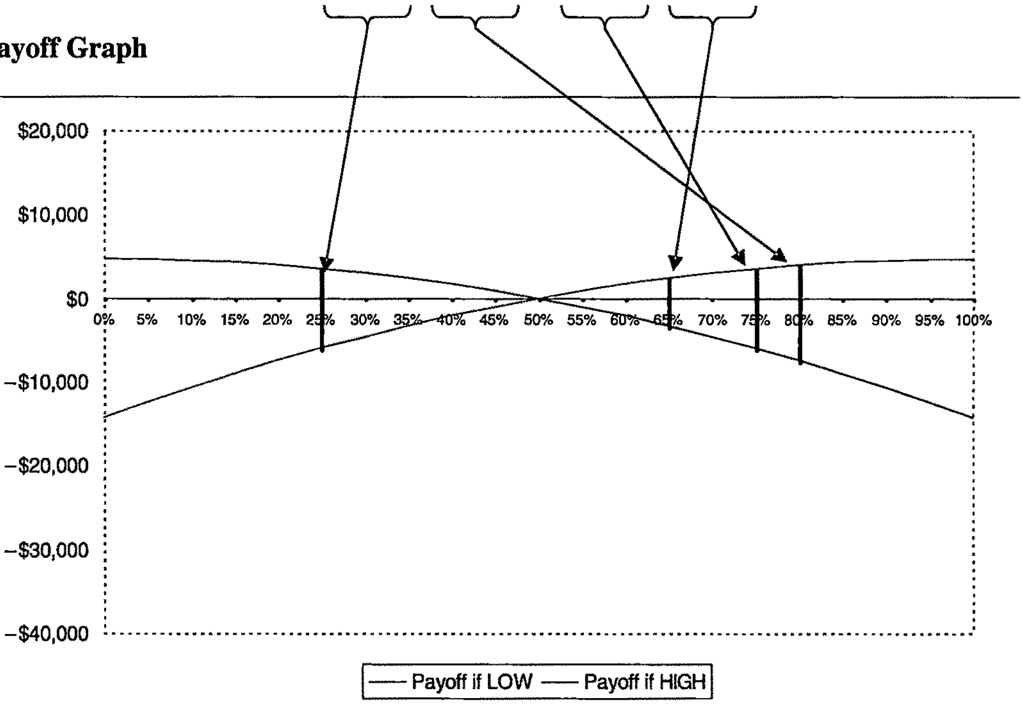
[9] If it seems counterintuitive that individual forecasts could be less extreme in the presence of mutual observation, even as the consensus becomes more extreme, then remember that mutual observation leads to convergence of opinion. Consider a simple example: Suppose two analysts assess alpha to be 30 and 100 (for a consensus of 65), without seeing each other's opinions, but settle on assessments of 45 and 95 (for a consensus of 70) when mutual observation is possible. In this case, mutual observation causes a decrease in average individual extremity (from 35 to 25), even as consensus extremity increases (from 15 to 20).

FIGURE 4
Example Table and Graph from Experiment 2

	A	B	C	D	Mean	Median
Judgments	**25%**	**80%**	**75%**	**65%**	**61%**	**70%**
Payoff if persistence is low	3,565	-7,416	-5,942	-3,280	-2,322	-4,564
Payoff if persistence is high	-5,942	3,993	3,565	2,424	1,862	3,042

Payoff Graph



This figure contains an example table and graph from Experiment 2. The table contains assessments of the probability that persistence is high for this firm. The payoff graph translates the individual forecaster assessments into their payoff implications, conditional on persistence actually being high or low.

yoked. Relative forecast error measures the error of the investor's assessment of alpha less the error of the consensus estimate.

Manipulation of Analyst Setting

Because investors saw assessments that were generated either with or without mutual observation, they saw analyst forecasts that, on average, had very different properties (i.e., dispersion, extremity, and accuracy). In addition to the manipulation of what type of forecasts investors saw, we also disclosed the context in which the assessments were made. Investors in the no-observation setting were simply told the following: "The four participants you will see from Part 1 were *not allowed to communicate* with one another and so had no knowledge of each other's judgments." In contrast, investors in the observation setting were given the following information:

> The four participants you will see from Part 1 were allowed to see one another's judgments. Specifically, while making their judgments, these participants could see the current average of the judgments submitted by their group members, and could adjust their own judgments as often as they wished before submitting a final judgment. If a participant updated his or her judgment, then the average was recalculated using the new judgment and the average was immediately communicated to all four participants in the group. All of the judgments you will see reflect the final judgments submitted by these four participants for each firm.

All investor participants were told that the analyst forecasters from Experiment 1 were paid according to the accuracy of the value estimate that followed from their judgment.

Manipulating Incentives for Accuracy

We code incentive strength in each period as either moderate or strong, exactly as it was coded in the analysis of Experiment 1 because our investor participants faced the same basic incentives as the analysts in Experiment 1, namely to forecast accurately—especially when forecasting the future performance of firms with recent abnormal performance. We should note, however, two minor differences to their incentive schemes. First, analyst participants in Experiment 1 were also compensated for the accuracy of the consensus, whereas investor participants in Experiment 2 received no such group compensation. Second, investor participants in Experiment 2 had the opportunity to scale up or down the payoff implications of their individual assessments.[10] Offering investor participants this option allows them to determine how much they want to rely on the opinions of others, given the incentives they face for being right or wrong (much like real-world investors have the option to take a larger or smaller position in a stock). However, because we found that use of the multiplier did not differ across treatments and does not alter our inferences when included, we ignore it in our classification of incentives and do not discuss it further.

Upon completion of the experiment, gains and losses in laboratory dollars were converted to U.S. dollars by adding a constant to their laboratory dollar amount, and then converting it with an exchange rate. Participants were paid either the calculated amount or $5, whichever was greater. Neither the constant nor the exchange rate was revealed to participants. Average compensation was $15.

Controlling for Consensus Extremity

In Experiment 1, we also controlled for the diagnosticity of the time-series information because forecast errors are likely to be correlated with diagnosticity (Bloomfield et al. 2000). We replace the factor for diagnosticity of the time-series information (which investors did not have access to) with a factor to control for the extremity of the consensus forecast, which is likely to explain a large portion of the individual variation in forecast properties (and which varies substantially across the various analyst cohorts to which investors were yoked). For consistency, we construct this control factor by ranking consensus estimates by extremity and classifying the consensus as low (if in the lowest three quartiles of extremity) or high (if in the highest quartile of extremity). Inferences are similar when the analyses are performed using quartiles rather than binary classifications.

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[10] After making their own assessment, investors were asked to choose a multiplier (1/4, 1/2, 1/3, 1, 2, 3, or 4). Choosing a multiplier of less than (greater than) 1 reduced (increased) the gain or loss relative to what it would have been with a multiplier of 1. Although this allows investors to scale the magnitude of their bet, they still maximize their expected gain by accurately reporting their probability judgment.

Results

Figure 5 displays the extremity (Panel A) and accuracy (Panel B) of investors' assessments of persistence, conditional on incentives for accuracy. As shown in Panel A, investor extremity, relative to the analyst consensus, depends strongly on analysts' opportunity for mutual observation ($p = 0.010$, one-tailed), as predicted in H4. In the no-observation setting, investors are significantly more extreme than the analyst consensus ($\mu = 8.49$, $p < 0.001$). In the observation setting, investor forecasts are no more or less extreme than the analyst consensus ($\mu = -1.22$, $p = 0.396$). Thus, our results confirm H4 with respect to extremity.

To further clarify the process by which investors react to the consensus and to provide additional support for the theory underlying H4, we estimated a regression model with investor extremity as the dependent variable and consensus extremity and dispersion as independent variables. The Bayesian model predicts that investor forecasts should be more extreme when the consensus is more extreme. In addition, investor extremity should be *increasing* in consensus dispersion in the no-observation setting, but not in the observation setting. To see why, recall that Bayesian aggregation places greater weight on more extreme forecasts. Therefore, the only time those investors should be no more extreme than the consensus is when forecast dispersion is zero. Because investors in the observation setting do not need to aggregate forecasts, we expect investors to weight all forecasts equally and so to be unaffected by the degree of dispersion.

Regression results strongly support our Bayesian predictions.[11] Coefficients on dispersion are positive in the no-observation setting (0.34, $p = 0.010$, one-tailed), while being indistinguishable from zero in the observation setting (–0.03, $p = 0.676$). The difference in the coefficients is statistically significant ($p = 0.006$, one-tailed). In these regressions, we also find that the coefficients on consensus extremity tend to be positive ($p < 0.001$) and are almost identical in the two settings (0.74 in the no-observation setting and 0.75 in the observation setting).

With respect to investor accuracy, the data provide mixed support for our predictions. We expected to find a main effect of observation, with investors in the no-observation setting performing significantly better than the consensus they observe. Instead, the result we predicted in H4 seems to have been swamped by an effect we did not predict: as can be seen in Panel B of Figure 5, investors in the no-observation setting do a worse job of combining analyst opinions when incentives are moderate ($p = 0.050$, two-tailed, not tabulated). This result suggests that performance on the task of combining forecasts is susceptible to incentives, just like performance on the task of interpreting time-series data, presumably because it requires intensity and duration of effort.

In a supplemental analysis, we find that, as a consequence of how investors respond to the consensus they observe, the only reliable predictor of absolute investor error is whether incentives for accuracy were moderate or strong, with strong incentives for accuracy leading to significantly lower absolute forecast errors ($p = 0.018$, two-tailed, not tabulated).

In summary, the results from Experiment 2 provide strong evidence that investors do indeed account for redundancy and do so in a manner consistent with economic theory. In

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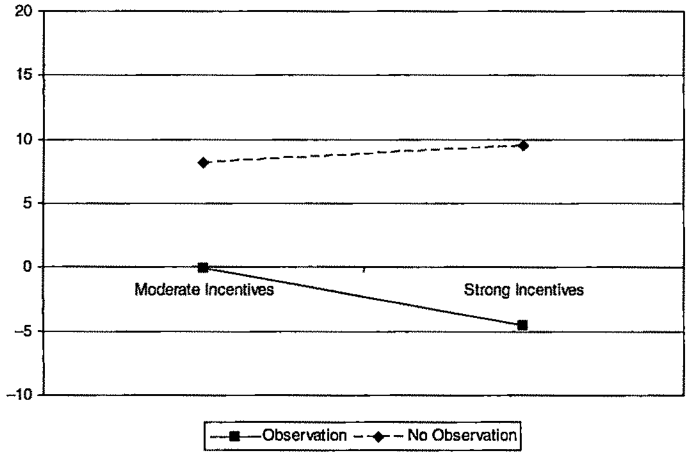
[11] Rather than pooling all 544 investor-year observations into a signal regression, we fit a separate regression for each investor's 16 individual forecasts and then analyze the coefficients from these 34 regressions to avoid overstating the statistical significance of the regression results.

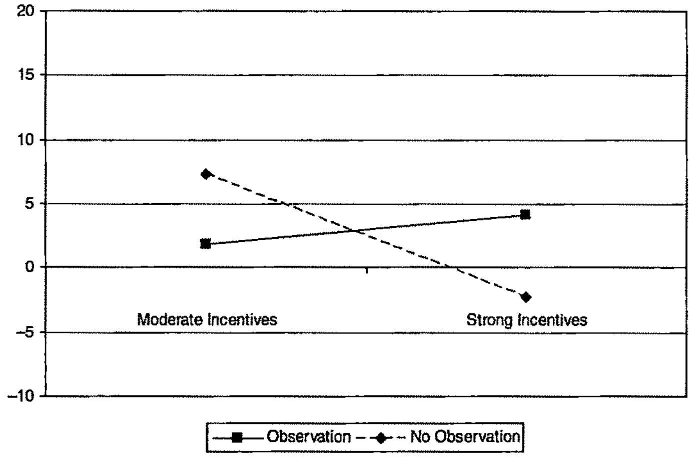
FIGURE 5
Investor Forecast Extremity and Accuracy

Panel A: Investor Forecast Extremity Relative to the Analyst Consensus



Observation: p = 0.020
Extremity: p = 0.015
Incentive: p = 0.732
Obs x Extrm: p = 0.551
Obs x Incentive: p = 0.096

Panel B: Investor Forecast Error Relative to the Analyst Consensus



Observation: p = 0.999
Extremity: p = 0.192
Incentive: p = 0.460
Obs x Extrm: p = 0.927
Obs x Incentive: p = 0.181

This figure reports the relative extremity and accuracy of investors' alpha assessments, conditional on whether mutual forecaster observation was allowed and whether incentives for accuracy are strong or moderate. Relative forecast extremity measures the difference between the investor's assessment of alpha and the consensus estimate of the cohort to which the investor has been yoked. Relative forecast error measures the absolute deviation between the investor's assessment of alpha and the optimal alpha implied by the data series less the same error measure as calculated using the consensus estimate. Alpha refers to the probability that abnormal earnings persist at a high rate (95 percent) rather than the low rate (65 percent). In the no-observation setting, investors are yoked to analyst cohorts from Experiment 1 in which mutual observation was not allowed. In the observation setting, investors are yoked to analyst cohorts from Experiment 1 in which mutual observation was allowed. To the right of each panel, we report two-tailed p-values from the full repeated-measures ANOVA described in the text.

particular, investors are most accurate when incentives for accuracy are strong—either because they are relying on analysts who are more accurate (the observation setting) or because they do a better job of combining analyst opinions (the no-observation setting). Our results provide little evidence that investor forecasts will be too extreme when relying on analysts who have the ability to observe one another.

V. CONCLUSION

Our first experiment demonstrates that mutual observation not only improves the ability of analysts to aggregate information, but also induces free riding unless incentives for accuracy are strong. Our second experiment shows that investors who are relying on the opinions of independent analysts are able to replicate the benefits of mutual observation by placing greater weight on the forecasts of analysts who extracted more information from the data set. Importantly, investors do not duplicate the process of observational learning when analysts already had the opportunity to observe one another's opinions. Even though the investors in the no-observation condition should have performed better than the consensus they observed, we did not find support for this prediction, perhaps because this effect was swamped by a result that we did not expect to find: investors in the no-observation condition do not appear to aggregate information very effectively when they themselves face the moderate incentives for accuracy that drove analysts to free ride.

Our findings on free riding are important because they bolster recommendations that professional standards should encourage analysts to use due diligence in conducting fundamental analysis, rather than simply relying on the consensus forecast. Most criticisms of analyst behavior focus on conflicts of interest (e.g., Lieberman 2002). Our study shows that insufficient incentives for accuracy may also cause serious problems, particularly when analysts have the ability to free ride on others.

As in most experiments, our laboratory setting differs in many ways from the environments experienced by real-world analysts. Our analysts can revise forecasts as often as they wish, publish those forecasts anonymously, and provide no information other than their forecast. Real analysts revise forecasts only after significant news events or much time has elapsed, develop reputations, and provide extensive information in addition to their forecasts. Future research could examine how changes in these features might alter the magnitude of the effects of mutual observation; however, we do not believe that these features account for our directional effects, or the reasons for those effects.

It may seem surprising to some that we find little evidence of psychological biases that might lead analysts or investors to over-rely on consensus information, as is often claimed in the context of empirical phenomena such as groupthink, group polarization, and other effects. One explanation for why we come to a different conclusion is that, as illustrated in the framework we develop, we account for the extent to which mutual observation *should* rationally result in greater consensus extremity when forecasters have the opportunity to learn from each other. Most prior studies in psychology simply assume that greater consensus extremity is *prima facie* evidence of irrationality.

Another explanation is that our setting is not a particularly powerful one for observing psychological biases. Future research might build on our framework by introducing additional richness to our task setting—for example, by allowing analysts to add persuasive arguments to their forecasts, by making revisions more costly, or by providing investors with information about the credentials and prior performance of analysts. Such information is likely to increase the tendency of participants to overweight individual analysts (as in Larrick and Soll [2006]) or to lead to group polarization (Glaeser and Sunstein 2007) and, as such, might provide more fodder for biases to take hold.

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Industry Specialization by Global Audit Firm Networks

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ABSTRACT: This study investigates the role of global audit firm networks in the market for audit services. Underlying theory suggests that there are benefits from the use of network structures, which enable these firms to expand efficiently into the global audit market and to develop global industry specializations. I identify global and national industry specialist auditors via market share metrics based on client assets audited, and use a large sample of 15,583 clients from 62 countries in 2000 and 14,628 clients from 60 countries in 2004. I find in both periods that audit fee premiums are consistently associated with global specialist auditors, irrespective of whether those audit firms are or are not national specialists.

Keywords: *audit fees; industry specialization; networks; international auditing.*

Data Availability: *Data is available from the sources described in the text.*

I. INTRODUCTION

Research attributes higher quality auditing to industry specialist auditors and generally finds that clients are willing to pay a premium for the services of specialized audit firms (Palmrose 1986; Craswell et al. 1995; Ferguson and Stokes 2002; Ferguson et al. 2003; Francis et al. 2005). In this study I extend this literature by examining industry specialization at a global level, viewing industry specialist groups within large audit firms as a specific example of the coordinated operations of global audit firm networks. This view is consistent with that of international standard-setters[1] and of the global audit firms

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[1] "Network" is defined and used in Section 290 of the IFAC Code of Ethics for Professional Accountants (revised July 2006) as "a larger structure: (a) That is aimed at co-operation, and (b) That is clearly aimed at profit or cost sharing or shares common ownership, control or management, common quality control policies and procedures, common business strategy, the use of a common brandname, or a significant part of professional resources." More detailed guidance on networks is provided in Section 290, paragraphs 16 to 26.

This paper is based on my dissertation at the University of New South Wales under the supervision of Roger Simnett. Earlier drafts have been presented at the Australian National University, University of New South Wales, Boston College, University of Queensland, Macquarie University, and the 2006 AAA Auditing Midyear Meeting. The comments and suggestions of two anonymous reviewers, Bill Kinney, Steven Kachelmeier, Jean C. Bedard, Michael Ettredge, Neil Fargher, Gerry Gallery, Keith Houghton, Gary Monroe, Greg Trompeter, and T. J. Wong are appreciated, as is the assistance of Per Christen Trønnes. The assistance of Amanda Barton in providing data is greatly appreciated.

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themselves.[2] This study examines whether audit fee premiums are obtained by global industry specialists and the inter-relationship between global and national industry specializations.

All of the major global audit firm networks use the strategy of creating multidisciplinary industry specialist teams supported by global knowledge management databases and common industry-specific work programs and training.[3] There is a considerable body of research surrounding industry specialization as a characteristic of specific audit partners, offices, or national firms. However, to date, there is no research examining industry specialization as a characteristic of the global audit firm network, or how industry specialization observed at a national level relates to that at a global level. This topic is of significant interest because large audit firms have invested considerable resources in structuring their international operations as global networks of audit firms, with the intention of improving audit quality. Within such global networks, knowledge, staff, and resources are shared on the basis of industry specialist groupings. To date, the research literature examining auditor industry specialization has focused upon gains attributable at a national (e.g., Craswell et al. 1995) or city (office) level (e.g., Ferguson et al. 2003). Here, I argue that there are economic gains attainable at a global level associated with the operational structure selected by auditors—that of global audit firm networks. In the context of contemporary business globalization, the role of global audit firm networks is particularly deserving of further research.

I utilize a large sample of 15,583 clients from 62 countries in 2000 and 14,628 clients from 60 countries in 2004 to identify both global and national industry specialist auditors. To enhance comparability with prior research, I use data from the year 2000, a period of relative stability in the global audit fee market (i.e., prior to the dissolution of the Arthur Andersen global firm), and 2004, following the demise of Arthur Andersen. I operationalize industry specialization at the global and national levels and document the persistence of the national specialization phenomenon across the global setting. I also examine the relationship between the national and global specializations of audit firm networks. Results show that significant audit fee premiums are consistently associated with global industry specialists, irrespective of national specialization. I also investigate whether the observed fee premiums are a global phenomenon, or driven by U.S. national industry leadership and find differing results for the U.S. compared to other countries. Section II describes prior research on industry specialization and the theory developed in this study. Section III outlines the hypotheses to be tested, with methods described in Section IV. Section V presents the results of the empirical tests and Section VI concludes the study.

II. THEORETICAL DEVELOPMENT AND PRIOR RESEARCH

This research investigates the relationship between industry specialists and audit fees. DeAngelo's (1981) agency-based framework suggests that large audit firms make significant investments in audit technology, which lead to increases in the number of clients served by a firm. This growth results in increased reputation costs for the firm. If a low-quality audit is discovered, then clients will leave the firm. Accordingly, DeAngelo (1981) argues that larger client portfolios act as collateral against poor-quality audits and those large auditors have incentives to avoid actions that may jeopardize their reputation. In this context, there are clear incentives for large audit firms to provide high-quality audit services.

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[2] Each of the audit firm networks is referred to as such on their websites. For example, PwC's home page states that "PricewaterhouseCoopers refers to the network of member firms of PricewaterhouseCoopers International Limited, each of which is a separate and independent legal entity."

[3] For example, KPMG's website claims, "Specialization by sector is fundamental to our approach. We believe that we cannot truly add value for our clients without a thorough understanding of their industry throughout the world." Deloitte's website claims, "Our industry and service line specializations bring distinctive value-added services to our clients across geographical and functional borders," while EY states, "With the development of the CBK (Center for Business Knowledge), every Ernst & Young employee now has access to the collective global knowledge and intellectual capital of the firm" and PWC states, "Worldwide, industry-specialized cross-disciplinary teams deliver services to clients."

I view global industry specialization as an extension of DeAngelo's (1981) arguments. The creation of industry specialists groups within large audit firms is one way to manage the provision of high-quality audit services to clients. DeAngelo's (1981) characterization of the large audit firm can be extended by viewing the firm in its entirety, which I argue in the contemporary business environment is the global audit firm network. Industry specialist networks, managed at a global level, are the mechanism by which existing knowledge is dispersed and new knowledge is captured. These actions also promote enhanced audit quality.

Lenz and James (2007) describe a network as being organized by contractual relations between entities that are legally autonomous and create degrees of mutual economic dependency between network members. This is reflective of the structure utilized by global audit firm networks.[4] Current national regulations often require audit firms to be owned by residents and require audits to comply with national standards. Accordingly, an integrated multinational structure is inappropriate for international expansion of audit firms and a hybrid structure, namely a global audit firm network, has evolved to fill this need. While national regulation has prevented a highly integrated organizational structure, given the existence of high litigation risks, it is beneficial that the network structure is relatively loose.

Rugman (1982, 15) argues that the key advantage of a global firm network is the ability to retain its internally developed knowledge and maintain control over its use globally. While audit firms develop knowledge about auditing generally, industry-based knowledge has additional value.[5] This knowledge can be tacit or codified.[6] In order to capitalize on codified knowledge, significant capital investment is required. While this situation favors large firms (due to the need to access greater resources in order to finance such investments), it also provides incentives for specialization. The global audit firm network is the efficient mechanism via which codified knowledge is developed, retained, and transferred.

Global audit firm networks have developed in response to client demand. Large clients, particularly those with multinational operations, demand consistent auditing throughout the world. Because client-industry knowledge is an important component of audit quality, the creation of industry specialist networks within global audit firm networks is an efficient means of delivering high-quality audit services to clients. While there are differences between accounting regulations and practices across countries,[7] these are often less pronounced than differences between industries.[8] Thus, exposure gained by servicing clients in one industry in one location can be readily transferred within the global network to clients in the same industry in another location. The auditor's ability to utilize industry knowledge obtained globally (particularly where industry "best practice" may be located outside the client country) increases the perceived value of auditing. The presence and value of knowledge spillovers increases in a specialist environment, especially when knowledge is systematically accumulated and stored in training material, built into audit processes, and stored on centralized databases for use and retrieval by industry specialists in other offices of the global audit firm network.[9,10] These spillovers can occur between offices throughout the global network and between engagements within industries.

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[4] For example, details of the KPMG global audit firm network are provided in KPMG's Transparency Report dated March 2005. This document outlines the legal structure of the network, governance structures within the network, membership criteria, and global core values as well as a detailed outline of the quality control procedures that operate throughout the network (KPMG 2005). The European Union's proposed Eighth Directive (Article 38) requires similar information to be provided by all audit firms undertaking statutory audits of public interest entities (Lenz and James 2007).

[5] Knowledge of the client's business and industry underpins both auditing standards (e.g., ISA 315) and firm developed audit methodologies (e.g., KPMG's business process methodology as outlined in Bell et al. [1997]).

[6] Tacit knowledge is characterized by its intangibility and includes know-how, experience, and motivation, while codified knowledge can be structured, analyzed, updated, and made accessible to multiple users. Both types of knowledge are important in auditing, however it is codified knowledge that is of most relevance to the global audit firm network.

Global industry specialist firms possess advantages not available to domestic audit firms. These competitive advantages include knowledge of diverse business practices, an ability to operate across multiple business environments, expertise developed from servicing similar clients in different locations, superior brand image, robust and efficient audit methodology and processes, knowledgeable and expert professional staff, and the ability to develop specific industry training and protocols. These competitive advantages attract clients seeking higher quality audits. As globalization of product and financial markets affects more industries and more countries over time, a greater number of clients will desire the higher quality services provided by a global audit firm network. Accordingly, I argue that clients seeking high-quality audit services will select and/or retain a global industry specialist auditor.[11]

Apart from client demand, there are other reasons for global industry specialization. From an economic perspective, Eichenseher and Danos (1981) argue that industry specialists achieve economies of scale by having a greater understanding of their clients' business environments. They demonstrate that industry specialization exists in public accounting at a national level and I extend the same arguments to specialists in a global market. DeAngelo (1981) also notes that knowledge of the client and industry can provide an incumbent firm with cost advantages over a new audit firm. In the context of industry specialization, Danos et al. (1989) discuss the economics of knowledge sharing and note that as specialized knowledge becomes more complex, it is less costly to train one auditor in a single knowledge area than to train all auditors in every knowledge area. When audit firms become industry specialists, barriers to entry into the audit market increase. In a local market, the barriers to entry for an audit firm to compete in an industry grouping are relatively low. By contrast, in the global marketplace, the barriers created by becoming a global industry leading auditor and developing a reputation as a global industry specialist are high.

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[7] For example, Khanna and Palepu (1997) note key institutional differences between economies such as capital, labor and product market drivers, the extent of government regulation, and manner of contract enforcement.

[8] For example, a key element in Deloitte's tender for the audit of Telstra (Australia's largest telecommunications company) was the promise to bring in talent from overseas to bolster its industry experience in the telecommunications industry (Walters and Andrews 2004).

[9] Examples of these systems include KPMG's KWorld, PricewaterhouseCoopers' TeamAsset and KnowledgeCurve and Ernst & Young's KnowledgeWeb (Vera-Muñoz et al. 2006).

[10] An example is PricewaterhouseCoopers: "We constantly strive to improve the effective operation of this network, investing in technology and training and establishing best-practice centers of technical and risk management advice. The investment we have made in our network enables us to collaborate across the world by sharing ideas, knowledge, methodologies, and approaches" (PwC 2007, 42).

[11] While the concept of specialization is not new, what is relatively new is the restructuring of the global audit firm networks along industry lines and the promotion of their industry expertise at a global level. This has been a structural change in Big N firms since the mid-1990s. KPMG is reported to have commenced reorganization along industry lines in 1993; other Big 6 firms followed shortly thereafter (Gramling and Stone 2001).

While a considerable amount of research examining the relationship between industry specialization and audit fees has been conducted in the U.S., the characteristics of their data are not necessarily representative of the full range of industries served by audit firms. For example, Palmrose (1986) and Casterella et al. (2004) both use survey data; the other U.S. studies use audits of public sector organizations (e.g., school districts: O'Keefe et al. 1994, Deis and Giroux 1996; municipalities: Ward et al. 1994) or niche markets such as pension plans (Cullinan 1998), IPOs (Mayhew and Wilkins 2003), or single industries (e.g., insurance: Pearson and Trompeter 1994). Studies that examine a full range of industries using publicly available data are generally conducted outside the U.S., for example in Australia (Craswell et al. 1995; Ferguson and Stokes 2002; Ferguson et al. 2003) and Hong Kong (DeFond et al. 2000). By contrast, the sample employed in this study has two advantages. It comprises a full range of industries, and also utilizes audit fee disclosures in a large number of countries (including the U.S.) in which global audit firm networks operate.

Prior research shows varying results regarding the effect of industry specialization on audit fees. Studies find all possible outcomes: no relation between audit fees and industry specialization (Palmrose 1986; Pearson and Trompeter 1994; Deis and Giroux 1996; Ferguson and Stokes 2002); a negative relation (Ettredge and Greenberg 1990; O'Keefe et al. 1994; Deis and Giroux 1996; Mayhew and Wilkins 2003); and a positive relation (Ward et al. 1994; Craswell et al. 1995; Cullinan 1998; DeFond et al. 2000; Ferguson and Stokes 2002; Ferguson et al. 2003, Mayhew and Wilkins 2003; Casterella et al. 2004). Given differences in time periods, locations, definitions of specialization, the levels at which specialization is considered (national or office level), and types of audits considered in prior research, the lack of consistent findings in the literature is not surprising. In the ensuing discussion, I focus on findings from studies examining large samples of publicly listed companies across a range of industries, as this better represents the audit market faced by global audit firm networks.

Craswell et al. (1995) find that Big 8 industry specialist auditors are paid an audit fee premium of approximately 16 percent over Big 8 non-specialist auditors in Australia in 1987. This suggests that industry specialist auditors are producing higher quality reports or providing other benefits (actual or perceived) to their clients, rather than just performing more efficient audits of equal quality. Ferguson and Stokes (2002) document that these premiums eroded in the post-Big 8 and post-Big 6 audit market. It is important to note that the Craswell et al. (1995) results are sensitive to changes in the market share cutoff used to define an industry specialist. The results reported are at a cutoff of 10 percent of audit fees, while no results are found for a cutoff of 20 percent of audit fees. In addition, industry specializations are examined only for industries with greater than 30 firms in the Australian market, reducing the generalizability of this finding to a small subset of industries that meet this criterion.

Other studies use industry leadership by audit firms as an alternate measure of industry specialization rather than threshold measures of market share. For example, Palmrose (1986) operationalizes industry specialists as the largest supplier in an industry, as well as the second and third largest if small differences in market share exist. DeFond et al. (2000) examine industry leaders as well as the three largest suppliers within an industry in the Hong Kong audit market, finding support for a positive relationship between audit fees and industry specialist auditors. Ferguson and Stokes (2002) and Ferguson et al. (2003) both examine industry leadership and also consider the second-ranked industry leader. Ferguson and Stokes (2002) find evidence of fee premiums to the industry leader in 1990, 1992, and

1994, but not 1998. Ferguson et al. (2003) further investigate this effect for 1998, demonstrating that where a firm is a national leader, as well as a city-level leader, there is evidence supporting a positive association between industry leaders and audit fees.

Recent research has focused on the importance of audit firm strategy in relation to industry specialization. Mayhew and Wilkins (2003) and Casterella et al. (2004) both incorporate Porter's (1985) "Five Forces" theory of competition and differentiation into the theoretical development of their hypotheses. Mayhew and Wilkins' (2003) IPO market study undertaken in the U.S. finds that audit firms, which are sufficiently differentiated from their competitors (via capturing market share within industries), are able to extract audit fee premiums from their clients. Casterella et al. (2004) find that premiums for industry specialization arise when clients have low bargaining power (defined as small clients). Both of these studies use the strategy literature to better understand industry specialization. This is consistent with the approach taken here, which uses the economic theory underlying network structures of global audit firms and their specialist networks to efficiently organize and maintain a product differentiated service.

In the only identified research into industry specialization at a global level, De Beelde (1997) investigates industry specialization by large audit firms globally using 1994 data covering 11,611 firms. However, he only examines client concentration based on the number of clients in an industry and does not examine pricing issues.

III. HYPOTHESIS DEVELOPMENT

The literature on industry specialization, combined with the theory supporting global audit firm networks as a means of providing superior audit quality, predicts that global industry specialists will achieve audit fee premiums. While the opposite is also possible if specialists achieve economies of scale and pass on the reduction in fees to clients, a more likely competitive response by global audit firms is to increase audit fees to better reflect the value of the audit and achieve an adequate return on the additional investments required by the specialist audit firm (i.e., product differentiation). There is little economic rationale for the view that cost savings will be passed on to the client for situations in which an actual or perceived higher quality service is being provided. Here, I argue that any premium due to product differentiation for industry specialists is in addition to that for product differentiation for brand name auditors generally. In order to clearly and separately identify premiums due to specialization and those due to brand name, I test industry specialization while including brand name as a control variable in the audit fee model for all clients. I then conduct a separate analysis of clients audited by global audit firm networks. Further, I argue that the premium attributable to global specialists is separately identifiable from that obtained by national specialists. Accordingly, I hypothesize that:

H1: Global industry specialist auditors will charge higher audit fees than other audit firms, irrespective of national industry specialization.

IV. METHOD

As shown in Table 1, 15,583 companies (2000) and 14,628 companies (2004)[12] representing 62 (60) countries drawn from Extel/Company Analysis comprise the basis for

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[12] For a company to be included in the sample, the total assets, auditor, and industry fields are required to be populated. Where more than one auditor is noted as signing the audit opinion, this observation is discarded.

TABLE 1
Global Sample Composition

Country of Incorporation	Number of Listed Firms in 2000	Number of Firms in 2000 Specialization Metrics	% of Listed Firms in 2000 Specialization Metrics	Number of Firms in 2000 Audit Fee Models	% of Listed Firms in 2000 Audit Fee Models	Number of Listed Firms in 2004	Number of Firms in 2004 Specialization Metrics	% of Listed Firms in 2004 Specialization Metrics	Number of Firms in 2004 Audit Fee Models	% of Listed Firms in 2004 Audit Fee Models
Argentina	127	51	40.16	1	0.79	104	30	28.85	0	0.00
Australia	1330	1310	98.50	1238	93.08	1515	1302	85.94	1260	83.17
Austria	97	82	84.54	0	0.00	92	68	73.91	3	3.26
Belgium	174	107	61.49	5	2.87	170	94	55.29	9	5.29
Bermuda[a]		392		373			413		379	
Brazil	459	147	32.03	0	0.00	357	149	41.74	3	0.84
Canada	1418	545	38.43	10	0.71	3597	723	20.10	267	7.42
Cayman Islands[a]		150		133			219		203	
Chile	258	73	28.29	1	0.39	239	76	31.80	0	0.00
China	1086	186	17.13	49	4.51	1384	251	18.14	172	14.43
Colombia	126	28	22.22	0	0.00	114	21	18.42	0	0.00
Czech Republic	131	30	22.90	0	0.00	54	21	38.89	4	7.41
Denmark	225	11	4.89	9	4.00	178	53	29.78	52	29.21
Finland	154	75	48.70	0	0.00	134	91	67.91	29	21.64
Germany	1022	626	61.25	4	0.39	660	484	73.33	12	1.82
Greece	329	170	51.67	7	2.13	340	146	42.94	0	0.00
Hong Kong	779	310	39.79	297	38.13	1086	324	29.83	312	28.73
Hungary	60	36	60.00	1	1.67	47	25	53.19	1	2.13
India	5937	195	3.28	168	2.83	4730	257	5.43	205	4.33
Indonesia	290	277	95.52	0	0.00	331	102	30.82	0	0.00
Ireland	84	83	98.81	76	90.48	62	60	96.77	54	87.10
Israel	654	73	11.16	4	0.61	571	69	12.08	12	2.10
Italy	291	251	86.25	12	4.12	264	243	92.05	8	3.03
Japan	2561	711	27.76	0	0.00	3220	915	28.42	64	1.99
Korea	1308	474	36.24	0	0.00	1573	422	26.83	0	0.00
Luxembourg	54	22	40.74	2	3.70	42	26	61.90	2	4.76
Malaysia	809	804	99.38	766	94.68	962	779	80.98	768	79.83

(continued on next page)

TABLE 1 (continued)

Country of Incorporation	Number of Listed Firms in 2000	Number of Firms in 2000 Specialization Metrics	% of Listed Firms in 2000 Specialization Metrics	Number of Firms in 2000 Audit Fee Models	% of Listed Firms in 2000 Audit Fee Models	Number of Listed Firms in 2004	Number of Firms in 2004 Specialization Metrics	% of Listed Firms in 2004 Specialization Metrics	Number of Firms in 2004 Audit Fee Models	% of Listed Firms in 2004 Audit Fee Models
Mexico	179	95	53.07	0	0.00	152	84	55.26	3	1.97
Netherlands	234	206	88.03	8	3.42	177	174	98.31	31	17.51
New Zealand	142	72	50.70	70	49.30	158	67	42.41	66	41.77
Norway	191	101	52.88	90	47.12	166	102	61.45	97	58.43
Pakistan	762	43	5.64	40	5.25	661	43	6.51	41	6.20
Peru	230	29	12.61	0	0.00	194	23	11.86	0	0.00
Philippines	228	214	93.86	0	0.00	233	200	85.84	2	0.86
Poland	225	49	21.78	0	0.00	225	64	28.44	1	0.44
Portugal	109	30	27.52	2	1.83	56	23	41.07	12	21.43
Russia	249	16	6.43	0	0.00	215	18	8.37	2	0.93
Singapore	456	441	96.71	410	89.91	489	439	89.78	307	62.78
South Africa	616	168	27.27	161	26.14	403	121	30.02	115	28.54
Spain	1019	115	11.29	3	0.29	3272	92	2.81	69	2.11
Sri Lanka	239	15	6.28	15	6.28	245	14	5.71	14	5.71
Sweden	292	122	41.78	113	38.70	256	146	57.03	143	55.86
Switzerland	263	255	96.96	5	1.90	282	241	85.46	133	47.16
Taiwan	531	376	70.81	0	0.00	697	461	66.14	0	0.00
Thailand	381	373	97.90	2	0.52	465	318	68.39	3	0.65
Turkey	315	115	36.51	0	0.00	296	163	55.07	2	0.68
United Kingdom	2428	2074	85.42	2031	83.65	2486	1733	69.71	1704	68.54
United States	7524	3392	45.08	2102	27.94	5231	2677	51.18	2652	50.70
Venezuela	85	25	29.41	0	0.00	59	18	30.51	0	0.00
Subtotal	36461	15545	42.63	8208	22.51	38244	14584	38.13	9216	24.10
Countries with 10 or less observations[b]		38		22			44		17	
Total	36461	15583		8230		38244	14628		9233	

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[a] Bermuda and Cayman Islands are considered to be tax havens and have a higher number of companies incorporated than are publicly listed in their country.

[b] These countries are Bahamas, Bolivia, British Virgin Islands, Cook Islands, Egypt, Jordan, Kenya, Liechtenstein, Mauritius, Morocco, Papua New Guinea, Slovak Republic, Zambia, and Zimbabwe.

calculating measures of industry specialization at global and national levels for the years 2000 and 2004. This list of companies includes the largest publicly listed firms in global capital markets—909 companies (2000) and 899 companies (2004) listed in the *BusinessWeek* Global 1000 are represented.[13] In order to test my hypothesis, I obtain audit fee data from the following sources.[14] In 2000, 5,567 companies reported audit fees on the Extel/Company Analysis database, supplemented by 2,117 U.S. audit-fee observations obtained from the Standard & Poor's Audit Fee database and 546 hand-collected Australian audit-fee observations. For 2004, 8,766 firms reported audit fees on the Extel/Company Analysis database, supplemented by 467 hand-collected observations. Thus, I obtain audit-fee observations for a total of 8,230 (2004: 9,233) companies, which is a subset of the companies used for calculating the industry specialization measures. Details on the sample by country (including the listed company population of each country) and the subgroup used for hypothesis testing are provided in Table 1. Arthur Andersen (only present in 2000 sample), Deloitte & Touche, Ernst & Young, KPMG, PricewaterhouseCoopers, BDO and Grant Thornton are identified as global audit firm networks.[15]

Measures of Industry Specialization

I partition industry specialization into three levels: (1) global industry leadership jointly with national industry leadership; (2) global industry leadership but no corresponding national industry leadership; and (3) national industry leadership but no corresponding global leadership. This partitioning has the advantage of separating instances of joint global and national specializations from instances of global (only) or national (only) specializations (similar to Ferguson et al. [2003]). This is important because the tests conducted to examine global industry specialization may, in fact, be detecting aggregated national industry specializations that have been identified in prior research (for example, Craswell et al. 1995).

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[13] To provide an example that the database represents the largest publicly listed firms, the average total assets of U.S. companies in the sample in 2000 is $6,160 million (2004: $10,318 million) compared to the average total assets of the population of U.S. firms drawn from Compustat of $3,502 million (2004: $5,167 million). While my sample includes about 40 percent of U.S. listed firms, these firms therefore represent almost 80 percent of the assets of listed firms in the U.S. (or alternatively, the remaining 60 percent of firms not included in my sample hold only 20 percent of total assets).

[14] Audit fees were required to be disclosed in the following countries in 2000: Australia, Bermuda, British Virgin Islands, Cayman Islands, Cook Islands, Denmark, Hong Kong, India, Ireland, Malaysia, Mauritius, New Zealand, Norway, Pakistan, Papua New Guinea, Singapore, South Africa, Sri Lanka, Sweden, U.K., U.S. (from 2001), and Zimbabwe. For all other countries, disclosure of audit fees is voluntary.

[15] Global audit firm networks are defined as the "founder members" under the Constitution of the Forum of Firms, which operates as the Transnational Auditors Committee of IFAC. In order to join the Forum of Firms, audit firms had to operate in multiple jurisdictions and subject themselves to network-wide quality control procedures providing evidence that these firms meet the definition of a "network" under the IFAC Code of Ethics for Professional Accountants. This group of firms also represents the founding members of the Global Public Policy Symposium and the CEOs of these firms presented joint statements on recommendations for change in auditing and financial reporting standards (DiPiazza et al. 2006). Specifically, they discuss the structure of their operations: "Our firms are structured legally as networks of national firms, rather than as single global operations, initially because of national differences in educational and licensing requirements." They further note that "data privacy and professional secrecy laws can make it impossible for globally integrated audit firms to conduct business in those countries through any other means than the current network arrangements that are common to all of our audit firms."

This study operationalizes industry specialization at the "industry" level,[16] using Global Industry Classification Standard (GICS).[17] Using the 38 GICS industry codes described in Table 2, I identify national industry specialists for each of the countries in the database, using market shares based on assets audited, consistent with the methodology used for identifying global industry specialists described previously.

I test my research hypothesis using the following OLS regression models:

$$\begin{aligned}\ln(Fee) = {} & \alpha + \beta_1 \ln(Assets) + \beta_2 CATA + \beta_3 Quick + \beta_4 Loss \\ & + \beta_5 Debt\_TA + \beta_6 OPAT\_TA + \beta_7 GAFN \\ & + \text{Country Indicator Variables} + \text{Specialization Measures} + \varepsilon.\end{aligned}$$

Dependent and independent variables are as follows:

Variable	Direction	Definition
ln(*Fee*)		Natural log of audit fee
Control Variables		
ln(*Assets*)	+	Natural log of total assets
CATA	+	Current assets to total assets
Quick	−	Current assets (less inventories) to current liabilities
Loss	+	1 if loss in current year
Debt_TA	+	Book value of debt divided by book value of assets
OPAT_TA	−	Net profit divided by total assets
GAFN	+	1 if audited by Global Audit Firm Network
Country	?	Indicator variable: country of observation
Variables of Interest		
Global #1 or #2, and National #1	+	1 if auditor is largest or second largest global industry leader and largest national industry leader based on percentage of total assets audited within an industry
Global #1 or #2, not National #1	+	1 if auditor is largest or second largest global industry leader but not largest national industry leader based on percentage of total assets audited within an industry
National #1, not Global #1 or #2	+	1 if auditor is largest national industry leader but not largest or second largest global industry leader based on percentage of total assets audited within an industry

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[16] The industry level of analysis is most similar to the methods employed in prior research: the 38 industries are comparable in detail to the 24 ASX industry codes used in Australian research such as Craswell et al. (1995), Ferguson and Stokes (2002), Ferguson et al. (2003), and two-digit SICs for U.S. research such as Mayhew and Wilkins (2003), Casterella et al. (2004), and Francis et al. (2005).

[17] Carson and Fargher (2007) also use the GICS codes to investigate industry specialization in the Australian national context. In the finance literature, Bhojraj et al. (2003) evaluate SICs, GICS, and other alternate industry groupings utilized in capital markets research. They find that GICS classifications are significantly better at explaining stock return movements, cross-sectional variation in valuation multiples, forecasted growth rates, and key financial ratios. Overall, they report that there is little difference between the performance of the other alternate industry groupings for research purposes.

TABLE 2
Specialization Metrics by Industry Based on Percentage of Assets Audited

GICS Industry	n	2000 Global Industry Leader	2000 Global Industry #2	2000 U.S. National Industry Leader	n	2004 Global Industry Leader	2004 Global Industry #2	2004 U.S. National Industry Leader
Aerospace and Defense	36	KP (62)	EY (12)	PWC (72)	39	DT (46)	EY (25)	DT (72)
Automobiles and Parts	266	PWC (26)	DT (22)	PWC (46)	285	DT (32)	PWC (25)	DT (55)
Banks	671	KP (27)	PWC (21)	KP (46)	583	KP (36)	PWC (20)	KP (37)
Beverages	135	KP (30)	PWC (19)	PWC (68)	118	KP (46)	PWC (26)	PWC (59)
Chemicals	381	PWC (30)	DT (19)	PWC (51)	403	PWC (23)	DT (21)	PWC (49)
Construction and Building Materials	865	AA (14)	DT (14)	AA (53)	797	EY (21)	DT (19)	EY (41)
Distributors	362	PWC (32)	DT (22)	EY (25)	317	DT (44)	EY (18)	EY (44)
Diversified Industrials	331	PWC (19)	DT (17)	AA (41)	279	KP (46)	DT (23)	KP (67)
Electricity	243	DT (27)	KP (21)	KP (34)	260	DT (31)	PWC (29)	DT (62)
Electronic and Electrical Equipment	1310	PWC (28)	KP (23)	PWC (40)	1302	EY (24)	PWC (20)	PWC (41)
Engineering and Machinery	984	PWC (19)	DT (13)	PWC (40)	871	PWC (24)	DT (20)	PWC (48)
Food and Drug Retailers	99	DT (34)	PWC (24)	DT (58)	86	PWC (35)	DT (28)	DT (59)
Food Producers and Processors	581	PWC (30)	KP (18)	PWC (41)	535	PWC (28)	KP (24)	EY (35)
Forestry and Paper	66	PWC (35)	EY (33)	EY (69)	81	PWC (45)	EY (34)	EY (79)
Gas Distribution	89	AA (37)	PWC (21)	AA (71)	95	PWC (34)	DT (30)	DT (55)
General Retailers	451	DT (22)	PWC (20)	EY (35)	428	DT (25)	EY (24)	EY (42)
Health	365	PWC (35)	EY (24)	PWC (36)	340	PWC (34)	EY (27)	PWC (40)
Household Goods and Textiles	747	DT (21)	PWC (15)	DT (29)	647	DT (30)	PWC (16)	DT (44)
Information Technology Hardware	152	EY (40)	PWC (22)	EY (47)	142	PWC (53)	EY (35)	PWC (57)
Insurance	270	KP (29)	PWC (28)	PWC (31)	237	KP (33)	PWC (29)	PWC (43)
Investment Companies	583	AA (62)	KP (11)	AA (88)	638	PWC (80)	DT (6)	PWC (93)

(continued on next page)

TABLE 2 (continued)

GICS Industry	n	2000 Global Industry Leader	2000 Global Industry #2	2000 U.S. National Industry Leader	n	2004 Global Industry Leader	2004 Global Industry #2	2004 U.S. National Industry Leader
Leisure, Entertainment, and Hotels	502	PWC (23)	EY (22)	AA (40)	420	EY (44)	PWC (26)	EY (59)
Life Assurance	38	PWC (59)	EY (17)	PWC (100)	39	PWC (36)	KP (32)	PWC (50)
Media and Photography	482	PWC (27)	AA (22)	PWC (33)	436	EY (29)	PWC (27)	KP (31)
Mining	542	PWC (37)	DT (20)	AA (47)	574	PWC (35)	DT (30)	PWC (62)
Oil and Gas	376	PWC (44)	EY (17)	PWC (61)	435	PWC (42)	EY (28)	PWC (53)
Packaging	203	AA (21)	PWC (20)	AA (49)	170	DT (26)	PWC (24)	DT (49)
Personal Care and Household Products	45	PWC (32)	AA (26)	AA (50)	54	PWC (47)	DT (23)	DT (41)
Pharmaceuticals and Biotechnology	414	PWC (38)	AA (15)	AA (34)	419	PWC (37)	KP (30)	PWC (36)
Real Estate	726	PWC (20)	EY (17)	EY (36)	616	EY (25)	DT (22)	EY (39)
Software and Computer Services	1098	EY (21)	DT (20)	DT (27)	936	DT (31)	EY (22)	DT (47)
Speciality and Other Finance	573	DT (22)	PWC (22)	DT (30)	397	EY (35)	DT (31)	DT (50)
Steel and Other Metals	132	PWC (25)	KP (22)	PWC (41)	184	KP (22)	PWC (21)	PWC (40)
Support Services	555	PWC (27)	AA (22)	AA (32)	606	PWC (31)	EY (23)	EY (36)
Telecommunication Services	407	PWC (27)	EY (20)	EY (36)	348	DT (28)	EY (26)	EY (39)
Tobacco	29	PWC (63)	DT (17)	PWC (82)	27	PWC (70)	DT (19)	PWC (85)
Transport	437	PWC (26)	DT (15)	EY (32)	451	PWC (33)	KP (19)	EY (37)
Water	34	PWC (66)	DT (15)	PWC (83)	36	PWC (41)	DT (34)	PWC (68)

AA = Arthur Andersen;
DT = Deloitte Touche;
EY = Ernst & Young;
KP = KPMG; and
PWC = PricewaterhouseCoopers.

V. RESULTS

Descriptive Results

Table 2 provides descriptive statistics on audit firm industry market shares at a global level, showing market shares based on assets audited in 2000 and 2004. The global industry leader (Global #1) is the audit firm with the largest assets audited within an industry, the firm with the second largest is designated Global #2. In addition, Table 2 discloses the market share and identity of the U.S. national industry leader. In 2000, in 21 industries (2004: 22 industries), the global industry leader is the same audit firm as the U.S. national industry leader. In 20 industries, the global industry leader is the same in 2000 and 2004. In 2004, the percentage of audits performed by country by the joint global-national industry specialist ranges from 0.5 percent (India) to 34.6 percent (Switzerland), for the global (only) industry specialist from 7.8 percent (India) to 34.2 percent (Singapore), and for the national (only) industry specialist from 2.2 percent (United States) to 22.7 percent (China).[18] A similar set of relationships is observed in 2000, in which the joint global-national industry specialist market share ranges from 0.6 percent (India) to 20.9 percent (Bermuda), for the global (only) specialists from 10.7 percent (India) to 27.9 percent (Hong Kong), and for national (only) specialists from 3.8 percent (United States) to 26.6 percent (Hong Kong).

By industry in 2004, Food Producers and Processors have the highest market share for national specialist auditors (29 percent) and the lowest market share for joint global-national specialists (5.5 percent). Food and Drug Retailers have the second highest market share for national specialist auditors (26.5 percent). The highest market share for joint global-national specialists is in Life Assurance (56.3 percent) followed by Water (38.5 percent), Gas Distribution (37.7 percent), Electricity (33 percent), and Beverages (28.8 percent). Low national specialist market shares are observed in Life Assurance (0 percent), Investment Companies (2.5 percent), Banks (5.6 percent), Mining (1.1 percent), Engineering and Machinery (4.4 percent), Oil and Gas (7 percent), and Health (4.6 percent) industry groups.

Table 3 presents descriptive statistics. The rationale for considering a sample of companies across all 38 industries is to examine global industry specialization across the entire global audit market and facilitate comparisons with prior research (such as Ferguson and Stokes 2002; Ferguson et al. 2003).

Due to skewness, the following variables are winsorized at the 5 percent level: *ln(Assets), Quick, Debt_TA*, and *OPAT_TA*. All currencies are converted to U.S. dollars using the conversion rate applicable at balance date. The average firm in the 2004 sample is larger than the average firm in the 2000 sample (U.S.$5.829 billion versus U.S.$3.344 billion) and mean audit fees have also increased over the period from U.S.$384,387 to U.S.$1,032,053.[19] Firms in 2000 have relatively higher short-term liquidity but a similar percentage of current assets to total assets as compared to firms in 2004. A slightly higher proportion of firms reports losses in 2000. Firms in both samples are similar in their choice of type of audit firm (85 percent are audited by global audit firm networks in 2000 compared to 81 percent in 2004). While a similar proportion of firms in both years are audited by the global (only) industry leader or the national (only) industry leader, a larger proportion of firms are audited by the joint global-national industry leader in 2004 as compared to 2000 (19 percent compared to 13 percent).

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[18] Respective percentages for United Kingdom: 2000: 12.8 percent, 17.9 percent, and 6.2 percent; 2004: 13.1 percent, 23.4 percent, and 8.9 percent; and United States 2000: 19.9 percent, 23.3 percent, and 3.8 percent; 2004: 25.3 percent, 25.2 percent, and 2.2 percent.

[19] Median audit fees increase from U.S.$96,000 to $162,000 between 2000 and 2004.

TABLE 3
Descriptive Statistics for All Companies
Samples for 2000 and 2004

Panel A: Continuous Variables

	2000 Data (n = 8,230)			2004 Data (n = 9,233)		
	Winsorized Mean (S.D.)	**Minimum**	**Maximum**	**Winsorized Mean (S.D.)**	**Minimum**	**Maximum**
Audit Fees (U.S.$000s)	384.387 (1562.202)	0.132	75,062	1,032.053 (3893.285)	0.170	202,000
Total Assets (U.S.$millions)	3,344.74 (26827.965)	0.009	902,210	5,829.135 (48934.85)	0.001	1,484,101
CATA	0.449 (0.278)	0.001	1.000	0.448 (0.275)	0.000	1.000
Quick	2.708 (4.617)	0.001	24.533	2.346 (2.830)	0.000	11.575
Debt_TA	0.207 (0.205)	0.001	0.792	0.199 (0.190)	0.000	0.632
OPAT_TA	−0.046 (0.406)	−4.580	4.520	−0.012 (0.158)	−0.506	0.170

Panel B: Categorical Variables

	2000 Data (n = 8,230) Mean	2004 Data (n = 9,233) Mean
Loss	32%	29%
Big N Auditor	80%	77%
GAFN Auditor	85%	81%
Global #1 or #2, and National #1	13%	19%
Global #1 or #2, not National #1	21%	22%
National #1, not Global #1 or #2	11%	10%

Variable Definitions:

CATA = current assets as a percentage of total assets;

Quick = current assets (less inventories) to current liabilities;

Debt_TA = book value of debt divided by book value of assets;

OPAT_TA = net profit divided by total assets;

Loss = indicator variable coded 1 if loss in current year;

Big N = Arthur Andersen, Deloitte & Touche, Ernst & Young, KPMG, PricewaterhouseCoopers;

GAFN = Global Audit Firm Networks; includes Arthur Andersen, BDO, Deloitte & Touche, Ernst & Young, Grant Thornton, KPMG, PricewaterhouseCoopers;

Global #1 or #2, and National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader and largest national industry leader based on percentage of total assets audited within an industry;

Global #1 or #2, not National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader but not largest national industry leader based on percentage of total assets audited within an industry; and

National #1, not Global #1 or #2 = indicator variable coded 1 if auditor is largest national industry leader but not largest or second largest global industry leader based on percentage of total assets audited within an industry.

From simple correlation analyses (not tabulated), each of the test variables shows statistically significant positive correlations with both audit fees and client size. In particular, audit fees and client size are very highly correlated, consistent with prior research using the audit fee model.

Results of Hypothesis Tests

Hypothesis 1 predicts that global industry specialist networks charge higher audit fees than other audit firms. Table 4 presents the key findings, with Models 1 and 2 showing results for 2000, and Models 3 and 4 showing results for 2004. The analyses first consider clients of all audit firms and then clients of brand name auditors (global audit firm networks).

Hypothesis 1: Global Industry Specialization and Audit Fee Premiums

The models shown in Table 4 demonstrate a consistently high explanatory power, with adjusted R^2s of 78–82 percent. As anticipated, the control variables are highly significant and in the predicted direction (with the minor exceptions of *OPAT_TA* and *Debt_TA* in 2004). Table 4, Model 1 shows the results for the global audit market in 2000 across all audit clients and all audit firms ($n = 8{,}223$). In Model 1, the joint global-national industry specialist (an indicator variable for the firm auditing the largest and second largest percentage of assets within an industry globally and the largest percentage of assets in an industry nationally) is associated with a highly significant, positive audit fee premium ($t = 4.542$; $p < 0.01$). The global industry specialist that is not a national specialist also receives a highly significant, positive audit fee premium ($t = 3.036$; $p < 0.01$), as does the national specialist that is not a global specialist ($t = 5.089$; $p < 0.01$). This premium is in addition to that achieved by brand name auditors ($t = 5.152$; $p < 0.01$). Thus, on average, the two audit firms auditing the largest percentage of assets in an industry globally both receive audit fee premiums, regardless of national specialization. Replicating this analysis in 2004, I find significant premiums for joint global-national specialists ($t = 3.385$; $p < 0.01$), as well as for global (only) and national (only) specialists.[20] Results of all model specifications demonstrate that global industry specialization contributes incremental explanatory power to existing audit fee models. In sum, the data support H1.

Table 4, Models 2 and 4 show the results of confining the sample to clients audited by global audit firm networks, consistent with the approach used by Craswell et al. (1995), Ferguson and Stokes (2002), and Ferguson et al. (2003) to test if industry specialist auditors earn a fee premium over their non-specialist, Big N counterparts. This research design has the advantage of holding brand name constant and directly testing for fee premiums attributable to industry leadership. The results for the global audit firm network sample in Models 2 and 4 are very similar to those for the all audit firm sample contained in Models 1 and 3. The control variables are significant and the models as a whole are well specified.[21] The premiums observed for joint global-national leadership, global (only) leadership, and national (only) leadership are highly consistent with those observed previously, providing further support for H1.

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[20] In Table 4, a highly significant difference is noted in Models 3 and 4 between G12/N1 and N1/notG12 ($t = 3.693$ and $t = 3.127$, respectively) and a marginal difference between G12/N1 and G12/notN1 in Models 1 and 2 ($t = 1.854$ and $t = 1.890$, respectively). All other differences between specialization coefficients are not significant.

[21] All variance inflation factors are below 2.0, below the commonly used cutoff of 10.0 for multicollinearity (Belsley et al. 1980).

TABLE 4
Global Audit Fee Models

	2000	**2000**	**2004**	**2004**
	Model 1 All Audit Firms, All Companies	**Model 2 *GAFN* Audit Firms, All Companies**	**Model 3 All Audit Firms, All Companies**	**Model 4 *GAFN* Audit Firms, All Companies**
	n = 8,223	n = 7,000	n = 9,233	n = 7,517
Intercept	0.991***	1.098***	1.099***	1.221***
	(25.549)	(26.485)	(26.190)	(25.081)
Ln*TA* (+)	0.548***	0.554***	0.604***	0.618***
	(107.749)	(102.686)	(107.542)	(100.582)
CATA (+)	1.316***	1.374***	1.233***	1.361***
	(37.526)	(37.875)	(35.942)	(34.865)
Quick (−)	−0.047***	−0.050***	−0.074***	−0.077***
	(23.476)	(22.247)	(22.479)	(20.147)
Loss (+)	0.232***	0.248***	0.304***	0.321***
	(10.990)	(10.819)	(10.911)	(10.216)
Debt_TA (+)	0.351***	0.412***	0.009	0.078*
	(7.880)	(8.485)	(0.183)	(1.393)
OPAT_TA (−)	−0.075***	−0.076***	−0.127*	−0.284***
	(3.300)	(3.114)	(1.568)	(2.950)
GAFN (+)	0.141***		0.233***	
	(5.152)		(8.637)	
Variables of Interest				
Global #1 or #2, and National #1 (+)	0.121***	0.116***	0.084***	0.075***
	(4.542)	(4.361)	(3.385)	(3.004)
Global #1 or #2, not National #1 (+)	0.067***	0.061***	0.111***	0.107***
	(3.036)	(2.783)	(4.808)	(4.590)
National #1, not Global #1 or #2 (+)	0.145***	0.135***	0.153***	0.146***
	(5.089)	(4.572)	(4.935)	(4.395)
Adj. R^2	0.79	0.78	0.82	0.80

(continued on next page)

TABLE 4 (continued)

***, **, * $p < 0.01$ (one-tailed test), $p < 0.05$, $p < 0.10$, respectively.

Variable Definitions:

Ln*TA* = natural log of total assets;
CATA = current assets as a percentage of total assets;
Quick = current assets (less inventories) to current liabilities;
Loss = indicator variable coded 1 if loss in current year;
Debt_TA = book value of debt divided by book value of assets;
OPAT_TA = net profit divided by total assets;
GAFN = Global Audit Firm Networks; includes Arthur Andersen, BDO, Deloitte & Touche, Ernst & Young, Grant Thornton, KPMG, PricewaterhouseCoopers;
Global #1 or #2, and National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader and largest national industry leader based on percentage of total assets audited within an industry;
Global #1 or #2, not National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader but not largest national industry leader based on percentage of total assets audited within an industry; and
National #1, not Global #1 or #2 = indicator variable coded 1 if auditor is largest national industry leader but not largest or second largest global industry leader based on percentage of total assets audited within an industry.

Country indicator variables are included in the above models but are not reported.

To demonstrate the economic significance of the Table 4 results, I determine the magnitude of the intercept shift across two subsets of observations as a percentage change. Using this method in Model 1 of Table 4, global audit firm networks achieve a 15 percent premium in audit fees and joint global-national industry specialists achieve a further 12 percent premium, whereas global specialists that are not also national specialists receive a further 7 percent premium relative to non-specialist audit firms in 2000. By way of comparison, national specialists receive a 16 percent premium. By 2004, the quantum of premiums has changed, with larger premiums for global (only) specialists and national (only) specialists and smaller premiums for joint global-national specialists.

Relationship between Global Industry Specialization and U.S. National Specialization

Within the strategic network structure adopted by global audit firms, U.S. firms are often key members of the network, commonly referred to as "hub" firms (Lenz and James 2007). I further explore the role of U.S. national industry leaders in Table 5. The substitution of a national industry leader variable for a U.S. industry leader variable into the audit fee models used in Table 4 yields similar results to those found for industry specialists when all countries are considered in 2000. To examine this result further, I partition the sample into U.S. and non-U.S. groupings. This analysis reveals that, in 2000, only joint global-U.S. national industry specialists obtain premiums for audit fee services within the U.S. ($t = 3.311$; $p < 0.01$), but that outside the U.S., joint global-U.S. specialists, global-only specialists, and U.S.-only specialists are more highly remunerated. The results differ for 2004. Joint global-U.S. industry specialists do not receive audit fee premiums in 2004 ($t = 0.594$; $t = 1.294$; $t = 0.090$; in Panel B, Models 1 to 3 respectively). Within the U.S., global (only) specialists are the only group of auditors to receive audit fee premiums ($t = 1.871$; $p < 0.05$). Outside the U.S., global (only) specialists ($t = 5.232$; $p < 0.01$) and U.S. (only) specialists ($t = 2.740$; $p < 0.01$) receive premiums. This provides evidence that both within and outside the U.S., there has been a shift from joint global-U.S. specialists receiving premiums to global (only) specialists receiving fee premiums. This is suggestive that the across-the-board audit fee increases in the U.S., possibly due to increased workloads associated with Sarbanes-Oxley, likely decreased the relative premium paid to specialist audit firms. In addition, U.S. national specialists continue to receive fee premiums for work performed outside the U.S. It is possible that the reputation of U.S. national specialists as the "hub" of the global network may result in a premium being paid by non-U.S. firms to obtain U.S. specialist audit services.[22]

Additional Analysis and Sensitivity Testing

Analysis of Multinational Clients Only

In order to assess the impact of global industry specialization on a sample of clients most likely to demand integrated global audit services, I examine a subset of multinational firms within the overall sample. These multinational firms are those that report that greater than 10 percent of their sales occur outside their home continent and are audited by global audit firm networks. This screen identifies 1,623 multinational firms in 2000 and 1,062 in

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[22] To further investigate the impact of U.S. capital markets on demand for industry specialist audit services, firms that are cross-listed on U.S. stock exchanges are further examined via the inclusion of an ADR indicator variable in the fee models presented in Table 4. ADR is highly significant and positive ($t = 9.840$; $p < 0.01$) and the specialization measures remained positive and highly significant. In addition, variables interacting ADR with the specialization measures were included in the regression models. ADR and the specialization measures continue to be highly significant and positive, the interaction terms are all positive with ADR × N1 being highly significant ($t = 2.461$; $p < 0.01$). This suggests that firms with U.S. cross-listings have an increased demand for national specialist audit services.

TABLE 5
Audit Fee Models

	Panel A: All Companies *GAFN* Audit Firms in 2000			Panel B: All Companies *GAFN* Audit Firms in 2004		
	Model 1 All Countries	Model 2 United States	Model 3 All Countries Excluding United States	Model 1 All Countries	Model 2 United States	Model 3 All Countries Excluding United States
	n = 7,000	n = 2,076	n = 4,924	n = 7,517	n = 2,499	n = 5,018
Intercept	1.104***	1.616***	1.071***	1.228***	2.517***	1.175***
	(26.838)	(18.062)	(22.879)	(25.242)	(22.961)	(21.579)
Ln*TA* (+)	0.557***	0.542***	0.561***	0.621***	0.577***	0.635***
	(104.271)	(55.534)	(87.707)	(102.351)	(47.274)	(90.466)
CATA (+)	1.378***	1.312***	1.390***	1.383***	1.182***	1.415***
	(37.995)	(19.540)	(31.848)	(35.559)	(14.619)	(31.353)
Quick (−)	−0.050***	−0.049***	−0.050***	−0.077***	−0.057***	−0.083***
	(22.152)	(11.551)	(18.551)	(20.234)	(7.379)	(18.817)
Loss (+)	0.248***	0.213***	0.251***	0.322***	0.296***	0.336***
	(10.807)	(5.286)	(8.932)	(10.236)	(5.257)	(8.854)
Debt_TA (+)	0.406***	0.278***	0.472***	0.073*	0.088	0.052
	(8.352)	(3.596)	(7.609)	(1.312)	(0.919)	(0.748)
OPAT_TA (−)	−0.078***	−0.163***	−0.064**	−0.292***	−0.336**	−0.261**
	(3.210)	(2.730)	(2.323)	(3.037)	(1.845)	(2.304)
Variables of Interest						
Global #1 or #2, and U.S. #1 (+)	0.089***	0.126***	0.067**	0.014	0.049	0.003
	(3.553)	(3.311)	(2.077)	(0.594)	(1.246)	(0.090)
Global #1 or #2, not U.S. #1 (+)	0.044**	0.011	0.056**	0.119***	0.073**	0.146***
	(2.006)	(0.308)	(2.077)	(5.210)	(1.871)	(5.232)
U.S. #1, not Global #1 or #2 (+)	0.160***	−0.002	0.243***	0.147***	0.054	0.196***
	(3.222)	(0.032)	(3.854)	(2.470)	(0.503)	(2.740)
Adj. R^2	0.77	0.64	0.72	0.80	0.53	0.74

(*continued on next page*)

TABLE 5 (continued)

***, **, * $p < 0.01$ (one-tailed test), $p < 0.05$, $p < 0.10$, respectively.

Variable Definitions:

Ln*TA* = natural log of total assets;
CATA = current assets as a percentage of total assets;
Quick = current assets (less inventories) to current liabilities;
Loss = indicator variable coded 1 if loss in current year;
Debt_TA = book value of debt divided by book value of assets;
OPAT_TA = net profit divided by total assets;
GAFN = Global Audit Firm Networks; includes Arthur Andersen, BDO, Deloitte & Touche, Ernst & Young, Grant Thornton, KPMG, PricewaterhouseCoopers;
Global #1 or #2, and National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader and largest national industry leader based on percentage of total assets audited within an industry;
Global #1 or #2, not National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader but not largest national industry leader based on percentage of total assets audited within an industry; and
National #1, not Global #1 or #2 = indicator variable coded 1 if auditor is largest national industry leader but not largest or second largest global industry leader based on percentage of total assets audited within an industry.

Country indicator variables are included in the above models but are not reported.

2004. The results in Table 6 demonstrate that all multinational firms pay a higher price for audit services in both 2000 and 2004. Model 1 confirms the existence of specialization premiums in 2000 (and Model 3 confirms this result for 2004). Interaction terms were added into the regression models for multinational firms and for each of the specialization measures in Models 2 and 4. These analyses demonstrate that, while all firms, on average, pay a premium for industry specialization, multinational firms do not pay an incremental premium. In 2000, multinational firms receive a discount if audited by a national (only) specialist.

There are two possible reasons for the lack of findings of additional specialist premiums for multinationals. First, the critical requirement for audit services delivered to multinational firms is the provision of efficient, integrated global audit services rather than industry-focused audit services. Second, as multinational companies are the target of the intense marketing efforts of the global audit firm networks, strong competition characterizes this sector of the market, both in obtaining and retaining these firms as audit clients.

Relationship between Global Industry Leadership and Client Size

Carson and Fargher (2007) present evidence suggesting that audit fee premiums attributable to industry specialization in Australia may, in fact, reflect that the audit fee model is not well specified for extremely large clients. Thus, it is difficult to separate a fee premium attributable to industry specialization from one attributable to the largest clients (which also dominate the method of calculating industry specialists). However, this result may be unique to the relatively small Australian capital market, in which a few large companies dominate some industry groupings.

This study uses a much larger sample size than is possible in the Australian setting. However, to examine the possibility that the audit fee model may not be well specified for large clients in the sample, I partition the sample into Large and Small client groups at the median of total assets. The results in Table 7 indicate that partitioning the sample by size has little impact on the significance of variables in the underlying fee model. In 2000, large clients are observed to pay premiums for joint global-national specialists and for national (only) specialists, whereas small clients pay premiums for all categories of specialists. By 2004, all partitions of specialists receive audit fee premiums irrespective of client size.

Analysis of Individual Audit Firms

In order to assess any possible impact of individual audit firms on the results reported previously, I replicate the analysis in Table 4, Model 1 for 2000 and 2004, successively removing each of the Big N audit firms. For 2000, all measures of specialization continue to be positive and highly significant, with the exception of the model excluding PwC. In this model, joint global-national specialists are negatively associated with audit fees, global (only) specialists are marginally positively associated with audit fees, while national (only) specialists are positively and highly significantly associated with audit fees. Similar models are run using the 2004 data and in all cases, joint global-national specialization, global (only), and national (only) specializations are found to be positively and significantly associated with audit fees. Overall, this suggests that the results for 2004 are highly robust against firm-level influence, while the results for 2000 are potentially influenced by a firm-level effect for PwC.[23]

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[23] Prior research also finds differential pricing by Price Waterhouse (Simunic 1980).

TABLE 6
Analysis of Multinational Clients of Global Audit Firm Networks

	2000	2000	2004	2004
	Model 1 All Companies	**Model 2 All Companies**	**Model 3 All Companies**	**Model 4 All Companies**
	n = 7,000	n = 7,000	n = 7,517	n = 7,517
Intercept	1.162***	1.151***	1.278***	1.280***
	(29.220)	(28.705)	(26.959)	(26.928)
Ln*TA* (+)	0.539***	0.539***	0.600***	0.600***
	(103.605)	(103.663)	(99.266)	(99.260)
CATA (+)	1.195***	1.192***	1.215***	1.215***
	(33.716)	(33.608)	(31.485)	(31.462)
Quick (−)	−0.046***	−0.046***	−0.069***	−0.069***
	(21.129)	(21.160)	(18.574)	(18.579)
Loss (+)	0.229***	0.231***	0.286***	0.286***
	(10.432)	(10.523)	(9.330)	(9.335)
Debt_TA (+)	0.393***	0.394***	0.116**	0.115**
	(8.466)	(8.482)	(2.135)	(2.121)
OPAT_TA (−)	−0.083***	−0.083***	−0.321***	−0.321***
	(3.563)	(3.542)	(3.429)	(3.428)
MNE (+)	0.545***	0.590***	0.563***	0.544***
	(25.163)	(19.162)	(20.881)	(12.595)
Variables of Interest				
Global #1 or #2, and National #1 (+)	0.105***	0.117***	0.067***	0.056**
	(4.117)	(3.948)	(2.774)	(2.143)
Global #1 or #2, not National #1 (+)	0.060***	0.073***	0.102***	0.102***
	(2.815)	(3.052)	(4.507)	(4.192)
National #1, not Global #1 or #2 (+)	0.126***	0.167***	0.134***	0.133**
	(4.481)	(5.195)	(4.144)	(3.848)
Global #1 or #2, and National #1 × *MNE* (?)		−0.055		0.074
		(0.969)		(1.107)
Global #1 or #2, not National #1 × *MNE* (?)		−0.061		0.000
		(1.198)		(0.005)
National #1, not Global #1 or #2 × *MNE* (?)		−0.168***		0.001
		(2.641)		(0.015)
Adj. R^2	0.78	0.79	0.81	0.81

***, **, * $p < 0.01$ (one-tailed test), $p < 0.05$, $p < 0.10$, respectively.

Variable Definitions:

Ln*TA* = natural log of total assets;
CATA = current assets as a percentage of total assets;
Quick = current assets (less inventories) to current liabilities;
Loss = indicator variable coded 1 if loss in current year;
Debt_TA = book value of debt divided by book value of assets;
OPAT_TA = net profit divided by total assets;
MNE = multinational enterprise coded 1 if sales of greater than 10 percent outside home continent;
Global #1 or #2, and National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader and largest national industry leader based on percentage of total assets audited within an industry;

(*continued on next page*)

TABLE 6 (continued)

Global #1 or #2, not National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader but not largest national industry leader based on percentage of total assets audited within an industry;

National #1, not Global #1 or #2 = indicator variable coded 1 if auditor is largest national industry leader but not largest or second largest global industry leader based on percentage of total assets audited within an industry;

Global #1 or #2, and National #1 × *MNE* = indicator variable coded 1 if auditor is largest or second largest global industry leader and largest national industry leader based on percentage of total assets audited within an industry and multinational enterprise coded 1 if sales of greater than 10 percent outside home continent;

Global #1 or #2, not National #1 × *MNE* = indicator variable coded 1 if auditor is largest or second largest global industry leader but not largest national industry leader based on percentage of total assets audited within an industry and multinational enterprise coded 1 if sales of greater than 10 percent outside home continent; and

National #1, not Global #1 or #2 × *MNE* = indicator variable coded 1 if auditor is largest national industry leader but not largest or second largest global industry leader based on percentage of total assets audited within an industry and multinational enterprise coded 1 if sales of greater than 10 percent outside home continent.

Country indicator variables are included in the above models but are not reported.

Analysis of Country Groupings

The analyses in Tables 4–7 were conducted using indicator variables for each of the countries represented in the sample (with the exception of Australia, which is included in the intercept). To consider the impact of alternate country groupings on the results reported previously, I remove the country indicator variables and instead include a series of alternate measures discriminating between countries. The measures are earnings opacity (Bhattacharya et al. 2003), level of auditor litigiousness as assessed by insurers (Wingate 1994), GDP, and quality of rule of law based on investor surveys (LaPorta et al. 1997). For earnings opacity, joint global-national specialization and global specialists continue to receive highly significant audit fee premiums ($t = 3.019$ and 4.217, respectively; $p < 0.01$). National (only) specialists do not receive significant audit fee premiums ($t = 0.004$; $p = 0.451$). Earnings opacity itself is significant and negatively related to audit fees (that is, as opacity increases, audit fees decrease). Using Wingate's litigation index, all measures of specialization are positive and highly significant as per Table 4, Model 1 ($p < 0.01$) and higher auditor litigation propensity is positively and significantly associated with audit fees. Using GDP as a control variable results in joint global-national specialization and global-only specialization remaining positive and significant, while national-only specialists are not associated with audit fee premiums. GDP is highly significant ($t = 48.281$; $p < 0.01$) and is positively associated with audit fees. LaPorta et al.'s (1997) measure of quality of legal enforcement is used as a control variable and is positively associated with levels of audit fees ($t = 35.339$; $p < 0.01$) and both measures of global specialists continue to receive audit fee premiums ($t = 2.248, 2.841$; $p < 0.05$, $p < 0.01$). Overall, these analyses suggest that the results reported previously are robust to the use of alternate control variables for country-level differences.

Analysis of Industrial Firms Only

To test the impact of global industry specialization excluding firms in the financial sector, I estimate models consistent with those in Table 4 for firms in the industrial sectors only. Industrial firms are tested specifically, as Fields et al. (2004) find that the drivers of

TABLE 7
Influence of Client Size on Global Specialization

Model	Panel A: Analysis of 2000				Panel B: Analysis of 2004			
	All Companies	All Companies	*GAFN* Auditors	*GAFN* Auditors	All Companies	All Companies	*GAFN* Auditors	*GAFN* Auditors
	Large	Small	Large	Small	Large	Small	Large	Small
	n = 4,115	n = 4,115	n = 3,500	n = 3,500	n = 4,616	n = 4,616	n = 3,758	n = 3,758
Intercept	0.414*** (4.133)	1.237*** (26.763)	0.649*** (6.861)	1.339*** (28.726)	−0.050 (0.430)	1.511*** (30.213)	0.208** (1.706)	1.719*** (28.025)
Ln*TA* (+)	0.594*** (65.727)	0.528*** (51.176)	0.600*** (61.911)	0.527*** (47.764)	0.712*** (64.656)	0.533*** (47.503)	0.728*** (57.306)	0.524*** (43.175)
CATA (+)	1.842*** (34.933)	0.880*** (21.305)	1.852*** (32.527)	0.955*** (20.876)	1.612*** (27.732)	0.943*** (23.551)	1.642*** (25.229)	1.082*** (23.262)
Quick (−)	−0.057*** (14.437)	−0.040*** (18.631)	−0.057*** (13.054)	−0.044*** (17.485)	−0.075*** (11.911)	−0.074*** (20.536)	−0.082*** (11.383)	−0.076*** (18.132)
Loss (+)	0.182*** (4.989)	0.202*** (7.970)	0.193*** (4.854)	0.224*** (8.108)	0.434*** (8.587)	0.174*** (5.491)	0.460*** (8.132)	0.205*** (5.733)
Debt_TA (+)	0.523*** (7.656)	0.269*** (4.735)	0.597*** (8.136)	0.338*** (5.301)	0.263*** (3.290)	−0.153*** (2.528)	0.284*** (3.208)	−0.011 (0.163)
OPAT_TA (−)	−0.274*** (3.165)	−0.067*** (3.000)	−0.252*** (2.710)	−0.063*** (2.632)	0.265 (1.174)	−0.151** (1.782)	0.390 (1.500)	−0.271*** (2.676)
GAFN (+)	0.262*** (4.102)	0.134*** (4.672)			0.419*** (6.165)	0.260*** (9.270)		
Variables of Interest								
Global #1 or #2, and National #1 (+)	0.133*** (3.821)	0.066* (1.577)	0.130*** (3.598)	0.069** (1.733)	0.080*** (2.380)	0.079** (2.162)	0.092*** (2.570)	0.059** (1.736)
Global #1 or #2, not National #1 (+)	0.039 (1.211)	0.098*** (3.382)	0.020 (0.606)	0.106*** (3.770)	0.117*** (3.413)	0.103*** (3.429)	0.127*** (3.438)	0.101*** (3.597)
National #1, not Global #1 or #2 (+)	0.158*** (3.669)	0.101*** (2.755)	0.135*** (2.832)	0.124*** (3.470)	0.154*** (3.320)	0.130*** (3.256)	0.145*** (2.712)	0.144*** (3.635)
Adjusted R^2	0.66	0.64	0.63	0.63	0.67	0.68	0.63	0.68

(*continued on next page*)

TABLE 7 (continued)

***, **, * $p < 0.01$ (one-tailed test), $p < 0.05$, $p < 0.10$, respectively.

Variable Definitions:

Ln*TA* = natural log of total assets;
CATA = current assets as a percentage of total assets;
Quick = current assets (less inventories) to current liabilities;
Loss = indicator variable coded 1 if loss in current year;
Debt_TA = book value of debt divided by book value of assets;
OPAT_TA = net profit divided by total assets;
GAFN = Global Audit Firm Networks; includes Arthur Andersen, BDO, Deloitte & Touche, Ernst & Young, Grant Thornton, KPMG, PricewaterhouseCoopers;
Global #1 or #2, and National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader and largest national industry leader based on percentage of total assets audited within an industry;
Global #1 or #2, not National #1 = indicator variable coded 1 if auditor is largest or second largest global industry leader but not largest national industry leader based on percentage of total assets audited within an industry; and
National #1, not Global #1 or #2 = indicator variable coded 1 if auditor is largest national industry leader but not largest or second largest global industry leader based on percentage of total assets audited within an industry.

Country indicator variables are included in the above models but are not reported.

audit fees for financial firms differ from those for industrial firms.[24] The models are similarly well specified with adjusted R^2s of 82–85 percent. The results are identical for 2000 and 2004 (that is, fee premiums are observed for all categories of specialization) with the exception of global (only) specialists in 2000, which are not observed to receive audit fee premiums in either the all audit firm or brand name audit firm samples. For multinationals, the results previously described also hold.[25]

VI. CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

This study examines industry specialization as a characteristic of global audit firm networks and the relationship between national and global industry specialization. I find that global industry specialists attract a highly significant, positive premium for audit fees. This premium is in addition to that received by global audit firm networks. These findings indicate that there are returns to global audit firm networks from investments in industry specializations. My analysis also demonstrates that national industry specialization is a separately identifiable construct from global industry specialization, and that significant fee premiums are associated with national industry leaders as well as with global industry specialization. I further examine the role of U.S. national industry leaders and find evidence of U.S. national industry leaders receiving fee premiums outside the U.S. market.

A potential limitation of this study is that audit fees were not mandatory disclosures in all jurisdictions at the time of this study and, thus, the conclusions drawn here can only be generalized to those countries in which audit fee data are available. This issue is mitigated in part by the time periods over which this study is conducted. By 2001, U.S. firms were required to disclose audit fees, thereby supplementing the fee data available in the Extel/Company Analysis database. For a number of countries, data are available for only a small number of companies. This issue is most likely to impact the identification of national industry specialists in countries not well represented in the database. In addition, this study's design requires that I categorize firms into a single industry, which may only partially fit the industry profile of conglomerate organizations. However, excluding this "Diversified Industrials" industry grouping does not impact the reported results. A final potential limitation relates to the method by which industry specialization is assessed. This study seeks to mitigate this limitation by using industry leadership that is unambiguous relative to specialization measures using arbitrary market share cutoffs.

One implication of this study for regulators is that the current system of regulation and enforcement of audit firm networks, which predominately occurs at a national level, is likely to be inadequate when audit firm networks and their clients span multiple jurisdictions. Accordingly, cross-border issues may essentially be unregulated. As a result, the International Auditing and Assurance Standards Board (IAASB) as a standard-setting body without enforcement powers, runs the risk of being ineffective in the current environment. Future research could address these issues, as well as the internal operations of global audit firm networks, to better understand the differences between individual audit firm networks, including those not related to specialization. Other methods of identification of industry specialists (for example, self-reporting by audit firms or identification by clients) could be pursued in future research. Studies of specialization at an audit partner, local, or national level should be carefully designed to separately examine each of the possible levels at which specialization can be identified. Future research can also identify clients most likely to benefit from the purchase of global specialist audit services and examine the broader relationship between these clients and identified specialists beyond audit fees. In particular, research should assess the influence of individual large clients on global audit firm networks.

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[24] Fields et al. (2004) note that these differences relate to complexity and risk. Variables in their audit fee model for financial firms include the percentage of transaction accounts to total deposits, commercial loans as a percentage of gross loans, mortgage loans as a percentage of gross loans, and nonperforming loans as a percentage of gross loans (among others). These variables are not available from Extel/Company Analysis.

[25] The models reported throughout include country indicator variables. In addition, industry-level indicator variables were included in the Table 4 models. The sign and the significance of the specialization variables do not change, while the explanatory power of the models improves slightly. Firms in the mining industry and in regulated industries are observed to receive significantly large audit fee discounts, consistent with prior research.

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The Performance of Analysts with a CFA® Designation: The Role of Human-Capital and Signaling Theories

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ABSTRACT: This study compares the performance of sell-side equity analysts with and without a Chartered Financial Analyst® (CFA) designation. Using a large sample of forecasts, our tests indicate that CFA charterholders issue forecasts that are timelier than those of non-charterholders. The results for accuracy are mixed. We establish that while charterholders perform at statistically significant higher levels than non-charterholders in some tests, the economic significance of these differences is questionable. For a subsample of analysts, we find evidence that charterholders improve along the dimension of timeliness after they receive their CFA charter. This result provides support for a human-capital explanation in which charterholders improve their productivity during the CFA program. Finally, we show that the market reaction for smaller firms is stronger for charterholders than non-charterholders after controlling for timeliness, boldness, accuracy, and optimism. This result provides evidence consistent with "credentialism," a variant of signaling theory in which a professional's education level provides a signal about the professional's quality to his or her clients.

Keywords: *analyst forecasts; analyst performance; human capital; signaling; credentialism.*

Data Availability: *Data are available from sources identified in the paper.*

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I. INTRODUCTION

Financial professionals, broadly defined to include analysts, investment managers, traders, brokers, financial executives, accountants, and academics, can choose to join CFA Institute. Passing a series of examinations, along with meeting other criteria, earns them the right to be called a Chartered Financial Analyst (CFA) charterholder (hereafter, charterholders). The demand for the CFA designation has grown tremendously in recent years. According to CFA Institute (2006a, 2006b, 2008), there were 10,000 charterholders in 1990. As of 2008, more than 89,000 charterholders work in 134 countries and 92,000 candidates were enrolled to take the CFA examinations. Given their large numbers, CFA charterholders and candidates wield significant influence in the global capital markets and financial decisions of corporations. For example, in the United States, regulators have awarded special status to charterholders.[1]

Our research objective is to understand the economic role of the CFA designation. In particular, this article compares sell-side equity analysts with a CFA charter to those without one. We consider two non-mutually exclusive theories of education to explain the CFA phenomenon. The human-capital view, as illustrated by Mincer (1974) and Becker (1975), is that people improve their productivity as a result of the knowledge and skills they acquire as part of their education. In our setting, this theory leads to an expectation that charterholders acquire additional financial knowledge and skills via the CFA program, which in turn leads to improved performance. The signaling view of education, presented in Spence (1973), Arrow (1973), and Stiglitz (1975), characterizes an equilibrium in which individuals obtain costly educational credentials correlated with their innate ability. An external party conditions its decision on the individual's education signal because it cannot easily observe the individual's innate ability. In the case of the CFA charter, analysts acquire the designation to signal their ability, and external parties use the CFA designation as a cue when making decisions about the analysts. Both theories lead to a prediction that, all else being equal, charterholders achieve higher levels of performance than do other analysts. Our first set of analyses tests this prediction.

Rich and publicly available data on analysts allow us to explore performance-related hypotheses about charterholders. We use the term "performance" broadly to include properties of forecasts studied in the analyst literature. Our two primary measures of performance are timeliness and accuracy, which measure the ability of analysts to use and generate information. We also study boldness, which along with timeliness measures analysts' independence and herding behavior. Our fourth measure is optimism, which is related to accuracy and captures whether the forecast is unbiased. For all four measures, we conduct a multivariate regression analysis. For the three measures excluding timeliness, we also use a matched-pair design in which we directly match charterholder and non-charterholder forecasts for the same firm, the same forecast period, and the same day. Controlling for the day of the forecast is particularly important because less-skilled analysts can simply wait a day and mimic the forecasts of more skilled analysts. In all tests, we compare analysts with a CFA charter to those without a charter, controlling for firm and time effects. The sample underlying these tests includes 798,272 annual forecasts for 4,920 firms issued by 909 charterholder and 2,794 non-charterholder analysts for the period January 1, 1999 to December 31, 2005. All our tests include controls for the forecast horizon, size of the analyst's brokerage firm, firm-specific experience, forecast frequency, and the number of companies and industries followed.

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[1] As of March 2005, a NASD rule approved by the SEC requires all sell-side analysts to pass a Research Analyst Qualification Examination (NASD 2004). Those analysts who have passed Level I and Level II of the CFA examination are exempted from the Analysis section (Part I) of the NASD exam.

We find evidence that charterholder forecasts are timelier than those of non-charterholders. The results for accuracy are mixed. Charterholders' forecasts are more accurate if we control for the day of the forecast and less accurate if we do not. There is some evidence that charterholders act more boldly and less optimistically. While we establish that charterholders perform at statistically significant higher levels than non-charterholders in some tests, the economic significance of these differences is questionable. The actual differences in empirical performance measures are in the range of 4 percent or less. This result is interesting because of the significant time and effort that people spend to become charterholders. This relative lack of economic significance could simply be because analysts obtain the CFA designation and training to overcome a relative deficiency with respect to other analysts. Non-charterholders could have acquired skills in accounting, finance, and economics via M.B.A. or undergraduate business degrees. Non-charterholders could also have degrees and skills more relevant to particular industries. For example, they could have degrees such as a Ph.D. or M.D., industry work experience, or a large network of industry contacts.

In our next set of analyses, we take advantage of our unique setting to measure performance both *before* and *after* charterholders obtain their CFA designation to attempt to determine whether one or both theories of education can explain the CFA phenomenon. In this set of tests, we restrict the sample to charterholders with forecasts available in both a pre- and post-CFA period. We match each charterholder with a non-charterholder who begins and ends forecasting in the same year and who is employed by a broker closest in size to the charterholder's employer at the beginning of the period. Through this matching we control for experience and broker size. We are able to successfully match 519 charterholders with a non-charterholder. These tests focus on timeliness and accuracy as our two primary performance measures.

In the period prior to charterholders obtaining their CFA designation, the forecasts of future charterholders are timelier than non-charterholder forecasts. Since this result is sensitive to the exclusion of forecasts issued in the three years immediately before attaining the CFA charter, it is not possible to completely attribute this difference to signaling theory. We also find evidence that charterholders become timelier relative to non-charterholders in the period after obtaining their charter. These results provide support for a human-capital explanation, in which CFA charterholders improve their productivity during the CFA program. We find no evidence consistent with either signaling or human capital theory when examining analyst accuracy.

In the last analyses, we investigate whether investors condition their decisions on whether analysts hold a CFA designation. Abnormal returns surrounding forecast revisions suggest that investors react more strongly to analyst forecasts issued by charterholders than those issued by non-charterholders, after controlling for timeliness, accuracy, boldness, and optimism. This finding holds for smaller firms only, which represent a less economically important group of firms. This overall result is consistent with the idea of "credentialism," a variant of signaling theory put forward by Lazear (1977), in which a professional's education credentials provide signals to his or her clients.

This paper contributes to the literature in four ways. First, we contribute to the literature that has studied whether various *ex ante* mechanisms such as Institutional Investor All-Star team selection (e.g., Stickel 1992) or prior performance (e.g., Sinha et al. 1997) predict the future performance of sell-side analysts. The CFA designation provides some potential advantages over these other measures. Since it is based on standardized tests administered by one organization, it is objective; it is also an option available to all analysts, including those who work for small brokerage firms.

Second, our results speak to the debate in theories of education. Although much research has been conducted on the role of primary school, secondary school, and university programs, research on the role of professional training and credentials is scarce. Furthermore, the extant educational literature provides only weak or mixed evidence in support of both human-capital and signaling theories. In contrast, our research setting provides unique tests of both theories by measuring performance both before and after the professional training. In addition we contribute to the limited research on credentialism.

Third, this study complements the limited literature on charterholders. The majority of this research studies buy-side analysts, uses small samples, and makes no attempt to determine alternative explanations for the popularity of the CFA designation.[2] Fourth, as mentioned above, the CFA designation is available to individuals who work in a variety of financial roles. In our particular setting, the benefits of signaling are reduced because sell-side analysts operate in the public domain and because much of their output (e.g., forecasts) is quantifiable and can be measured against benchmarks (e.g., actual earnings or forecasts issued by other analysts). The CFA designation as a signaling mechanism could be more important for professionals who operate in fields in which their output is intangible or private.

Section II provides an overview of the literature on the human-capital and signaling theories of education. It develops our hypotheses about the role of these theories in explaining the CFA phenomenon. Sections III and IV discuss our sample and variables, respectively. Section V presents our regression and matched-forecast pair tests. The pre- and post-CFA matched-analyst tests are presented in Section VI. In Section VII we provide some additional analyses showing that investors condition their price reaction on the CFA "signal." The last section concludes. The Appendix contains variable definitions.

II. THEORIES OF EDUCATION AND HYPOTHESIS DEVELOPMENT

While more traditional forms of education, such as primary, secondary, and university schooling have been examined, research on the value of professional credentials such as the CFA designation is scarce. To earn the CFA charter, financial professionals must pass a series of three examinations taken in sequential levels, have at least four years of acceptable investment-related professional work experience, and join CFA Institute and comply with all its membership policies. CFA Institute estimates that candidates spend approximately 250 hours preparing for each examination. Since charterholders exert significant effort to complete the program, they must have an expectation that the CFA designation provides some benefit. As mentioned above, both human-capital and signaling theories predict that the CFA designation should be associated with higher-productivity analysts. Our first hypothesis is (in alternative form):

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[2] A small literature on charterholders exists, but none of these studies examine sell-side analysts and all use small samples. Shukla and Singh (1994) study the performance of 223 equity mutual funds for the period July 1988 to December 1992. They find that the funds managed by at least one CFA-designated manager were riskier but better diversified, and outperformed on a risk-adjusted basis the funds with no charterholder managers; however, on average they did not outperform the S&P 500 benchmark index. Brockman and Brooks (1998) find that growth over time in the aggregate number of charterholders is positively related to growth in the value of the S&P 500 Index from 1963 to 1995. Based on a survey from 41 U.S. public-sector pension fund administrators, Miller and Tobe (1999) find that the pension funds that employ one or more charterholders as part of their investment management team have lower total investment management costs on average than those that do not employ charterholders; however, they do not examine the relative performance of plan assets.

H1: *Ceteris paribus*, analysts with a CFA designation achieve higher levels of performance compared to analysts who do not hold a CFA designation.

While it is well established in the education literature that more-educated workers have higher productivity, *ceteris paribus*, labor economists such as Weiss (1995) and Riley (2001) have long debated the role of signaling and human-capital theories in explaining this relation. In general, results from studies that try to distinguish between the two theories are weak or mixed.[3] In our setting, we have the advantage of being able to directly measure performance both before and after analysts obtain their CFA designation. Signaling theory predicts that individuals who have higher innate ability will use education to signal this ability. We use performance prior to the CFA program as a proxy for innate ability to test whether signaling is an explanation for the CFA phenomenon. We formalize this in a signaling hypothesis (in alternative form):

H2: Analysts with a CFA designation achieve higher levels of performance in the period prior to obtaining their CFA designation, relative to analysts who do not hold a CFA designation.

The human-capital view of education is that people improve their productivity as a result of the knowledge and skills they acquire as part of their education. If improved human capital is part of the reason analysts obtain a CFA designation, then the performance of charterholders should improve over the period that they obtain their CFA charter. Our human-capital hypothesis is (in alternative form):

H3: Analysts with a CFA designation achieve higher levels of performance in the period after obtaining their CFA designation compared to the prior period, relative to analysts who do not hold a CFA designation.

This hypothesis is in the form of changes, in which we take advantage of the pre-CFA period performance measure to control for differences in innate ability.

III. SAMPLE

Data

From the I/B/E/S Detail History database for the period from January 1, 1999 to December 31, 2003, we generate a list of unique analyst-broker names. For each analyst we search Investext (or if necessary, First Call) for one of his/her reports published after January 1, 1999. If an analyst includes (does not include) the CFA mark after his/her name, then the analyst is placed in the charterholder (non-charterholder) sample. Those analysts for whom we could not find a report are excluded. We exclude analyst teams, which could consist of both charterholders and non-charterholders. The sample after this process includes a total of 4,380 analysts, of which 1,017 are charterholders and 3,363 are non-charterholders. We obtain stock return data and SIC codes from CRSP.

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[3] For example, Boissiere et al. (1985) and Chevalier et al. (2004) find empirical support for predictions specific to human-capital theory, while Altonji (1995) and Chiswick et al. (2003) do not. In the case of signaling, Riley (1979) and Miller et al. (2004) present evidence supporting the theory, while contrary results have been presented by Layard and Psacharopoulos (1974), Psacharopoulos (1979), Wolpin (1977), and Chevalier et al. (2004).

Sample of Firms and Forecasts

We require that sample firms be domiciled in the United States and have data available from both I/B/E/S and CRSP for the period January 1, 1999 to December 31, 2005 to calculate our variables. We limit our study to annual forecasts issued within the two-year period prior to the annual earnings announcement date. Each firm in the sample must have at least one charterholder and at least one non-charterholder covering it to mitigate the possibility that our test results are due to charterholders and non-charterholders simply selecting different firms to follow. These restrictions result in a sample of 798,272 forecasts issued for 4,920 firms, of which 227,472 (570,800) forecasts were issued by 909 charterholders (2,794 non-charterholders).

IV. VARIABLE DESCRIPTION AND MEASUREMENT

Measures of Analyst Performance

Timeliness: Following Cooper et al. (2001), our measure of analyst timeliness is based on the pattern of forecasts surrounding the forecast of interest. For each forecast in our sample, we compare the number of days between it and the forecasts by other analysts that precede and follow it. $Leading\ Days_{ijkt}$ ($Following\ Days_{ijkt}$) equals the total number of days between analyst *i*'s forecast of firm *j*'s fiscal period *k* earnings issued on day *t* and the two most recent preceding (following) forecasts of firm *j*'s fiscal period *k* earnings by any other analyst. The *Timeliness* of each forecast is $Leading\ Days_{ijkt}$ scaled by $Following\ Days_{ijkt}$.[4] A timelier forecast is consistent with two scenarios: (1) other analysts reacting to the news in analyst *i*'s forecast, or (2) some public event occurring and analyst *i* interpreting and analyzing the news more quickly than other analysts. In contrast, a less-timely forecast is more consistent with analyst *i* either reacting to the forecasts of other analysts, or interpreting and analyzing the same public news as other analysts, but at a slower rate. As in Cooper et al. (2001), our estimates of *Leading Days* and *Following Days* for a given analyst forecast exclude any additional forecasts by that analyst during the pre- or post-release periods. If another analyst issues a forecast on the same day it is excluded from the computation of $Leading\ Days_{ijkt}$ and $Following\ Days_{ijkt}$.

Accuracy: Analyst forecast accuracy is the absolute value of the forecast error (forecasted EPS less actual EPS reported by I/B/E/S), multiplied by -1 so that higher values of *Accuracy* are associated with more accurate forecasts. Many studies have previously investigated analyst accuracy; some examples are Sinha et al. (1997), Mikhail et al. (1997, 1999), Clement (1999), Jacob et al. (1999), Brown and Mohd (2003), Clement and Tse (2003, 2005), and Malloy (2005).

Boldness: The greater the degree to which an analyst's forecast revision deviates from the pre-revision consensus estimate, the more bold the forecast. Boldness is the absolute value of the forecasted EPS less the consensus EPS. Studies that investigate analyst boldness include Hong et al. (2000), Gleason and Lee (2003), and Clement and Tse (2005).

Optimism: We measure the optimistic bias in analysts' forecasts using the signed forecast error. Analyst optimism is well documented in studies such as Brown (2001), Gu and

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[4] Cooper et al. (2001) provides an example calculation. Analysts C and D issue forecasts that precede analyst *i*'s forecast by 10 and 9 days respectively, so that *Leading Days* equals 19. In contrast, analysts X and Y's forecasts follow quickly, 1 and 2 days respectively, after analyst *i*'s forecast so that *Following Days* equals 3. *Timeliness* for this example is 6.33 (i.e., $(10 + 9)/(1 + 2)$) and analyst *i*'s forecast would be considered timely. Now assume that the opposite pattern of forecasts holds. In this case *Timeliness* is 3/19, consistent with a less timely forecast.

Wu (2003), and Richardson et al. (2004). Studies that investigate the reasons for this optimism include Francis and Philbrick (1993), McNichols and O'Brien (1997), Das et al. (1998), Lin and McNichols (1998), Michaely and Womack (1999), and Dechow et al. (2000).

Analyst Characteristics

Prior research such as Clement (1999), Clement and Tse (2003, 2005), and Malloy (2005) documents that differences in analyst performance can be partially explained by analyst characteristics. Analysts' characteristics are defined as follows. *Fcst Horizon* is the number of days from analyst *i*'s forecast on day *t* to firm *j*'s fiscal period *k* end date. *Broker Size* is the number of analysts employed by the brokerage firm employing analyst *i* in the 12-month period prior to day *t*. *Fcst Frequency* is the total number of firm *j* forecasts for fiscal period *k* made by analyst *i*. *Firm Experience* is the number of years from the first forecast day of firm *j* earnings by analyst *i* to day *t*.[5] *Companies* is the number of companies followed by analyst *i* in the 12-month period prior to day *t*. *Industries* is the number of unique two-digit SICs of all the companies followed by analyst *i* in the 12-month period prior to day *t*.

Variable Standardization

To facilitate comparisons across observations, we follow Clement and Tse (2003, 2005) and standardize each of the performance and characteristic variables to range from 0 to 1 using a transformation that maintains the relative distances between each variable's measures for firm *j* in fiscal year *k*. A high value for the standardized variable indicates that on day *t*, analyst *i* attains a high value for that variable relative to other analysts who issue forecasts of firm *j*'s fiscal period *k* earnings. This standardization results in a relative measure for all analysts who follow the same firm for the same fiscal period and thus controls for systematic firm year differences in the variables.

Descriptive Statistics

Table 1, Panels A and B present the distribution of the analyst characteristics variables before and after they are standardized, respectively. The measures are first calculated per forecast and then aggregated by analyst. When calculating the mean, median, and differences, each analyst contributes one observation. The means and medians, broken out separately for charterholders and non-charterholders, are generally similar to those in previous studies by Clement and Tse (2003, 2005) with the following exceptions. The average brokerage size is larger in our study than in previous studies. Untabulated analysis indicates that this is due to the later time period of our sample. The forecast horizon is greater and the forecast frequency is higher in our study because previous studies limit their samples to the last forecast made by the analyst per firm year. The differences between charterholders and non-charterholders are presented in the last columns. Charterholders issue forecasts with longer horizons, work for smaller brokerage firms, forecast more frequently, have

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[5] We use firm-specific experience throughout our tests. An alternative measure used by Clement (1999) and Clement and Tse (2005) is general experience, which is likely correlated with analyst age and is defined as the number of years of analyst forecasting experience for any firm. General experience is highly correlated with firm-specific experience. Untabulated analysis reveals that the correlation coefficient between these two measures is 0.72. Our test results are unchanged if we include general experience as an additional control variable.

TABLE 1
Descriptive Statistics
Analyst Characteristics

Characteristic	Charterholders (n = 909)		Non-Charterholders (n = 2,794)		Difference			
	Mean	Median	Mean	Median	Mean	t-statistic	Median	z-statistic
Panel A: Raw (Not Standardized) Analyst Characteristics[a]								
Fcst Horizon	267.5	271.3	261.6	269.1	5.9***	2.91	2.2**	2.14
Broker Size	62.1	43.9	73.5	54.0	−11.4***	−5.28	−10.1***	−4.39
Fcst Frequency	4.6	4.5	4.5	4.3	0.1	1.28	0.2***	2.54
Firm Experience	1.8	1.1	1.4	0.9	0.4***	6.32	0.2***	6.91
Companies	10.4	10.0	9.3	8.8	1.1***	4.69	1.2***	6.00
Industries	3.3	2.9	2.8	2.3	0.5***	7.01	0.6***	7.13
Panel B: Standardized Analyst Characteristics[b]								
Fcst Horizon	0.4759	0.4630	0.4697	0.4576	0.0062	1.21	0.0054	1.58
Broker Size	0.3718	0.3037	0.4193	0.3501	−0.0475***	−3.92	−0.0464***	−3.28
Fcst Frequency	0.4134	0.4371	0.3858	0.4000	0.0276***	3.57	0.0371***	3.99
Firm Experience	0.3039	0.2806	0.2622	0.2262	0.0417***	5.75	0.0544***	6.42
Companies	0.3152	0.2945	0.2699	0.2258	0.0453***	5.11	0.0687***	5.62
Industries	0.3402	0.3126	0.2786	0.2405	0.0616***	6.44	0.0721***	6.52

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels respectively. Variables are defined in the Appendix.

This table reports descriptive statistics about analyst characteristics for both CFA charterholder and non-charterholder analysts. The underlying sample of forecasts consists of 798,272 forecast observations for 4,920 firms over the period January 1, 1999 to December 31, 2005. Analyst characteristics are derived from detailed I/B/E/S data. The measures are first calculated per forecast and then aggregated by analyst. When calculating the mean, median, and differences, each analyst contributes one observation to the analysis.

[a] Panel A compares the mean and median values of raw (not standardized) characteristics between CFA charterholders and non-charterholders.

[b] Panel B compares the mean and median values of standardized characteristics between CFA charterholders and non-charterholders.

more firm-specific experience, and follow more companies and industries than do non-charterholders.[6]

V. CFA CHARTERHOLDER PERFORMANCE TESTS

Multivariate Regression Tests and Results

To test for differences in charterholders' performance, we estimate:

$$Performance_{ijkt} = \alpha + \beta CFAd_{ijkt} + \gamma Analyst\ Characteristics + \varepsilon_{ijkt}. \tag{1}$$

Performance is one of the four analyst performance measures. *CFAd* is an indicator variable that equals 1 if analyst i is a CFA charterholder, and 0 otherwise. Consistent with our hypotheses, we expect that forecasts issued by analysts who hold a CFA charter to be timelier, more accurate, bolder, and less optimistic relative to those issued by analysts without a charter, *ceteris paribus.*

We use the full sample of forecasts for the accuracy, boldness, and optimism tests. For timeliness, we follow Cooper et al. (2001) and further restrict the sample. We control for the tendency of analysts to revise forecasts following firms' release of earnings by eliminating forecast revisions that occur within the three-day window centered on earnings announcements. We also require two forecasts prior to and two forecasts after a forecast observation. As an alternative test, for each measure, we also provide results using a sample restricted to the last annual forecast issued at least 30 days before the fiscal year-end by each analyst for each firm each fiscal year, consistent with Clement and Tse (2005).

Throughout our analysis, we estimate these equations on a monthly basis using ordinary least squares and then present mean coefficients as in Fama and MacBeth (1973). This allows for any cross-sectional correlation of unknown form across analysts, firms, and industries. We correct the standard errors using the Newey and West (1987) adjustment with 12 lags for serial dependence in the coefficients. This adjustment assumes that there is no correlation among coefficients that are more than 12 months apart.

The results of estimating Equation (1) for each of the four performance measures are summarized in Table 2. In the first two columns, the coefficient on *CFAd* is positive and significantly different from zero, consistent with charterholders producing timelier forecasts than those of non-charterholders. We also find that forecast timeliness is positively related to analysts' brokerage size, forecast frequency, firm-specific experience, and number of companies followed. These results complement Clement and Tse (2005), who find that these four analyst characteristics are positively correlated with forecast boldness.

The tests for accuracy are reported in Columns 3 and 4. The *CFAd* coefficient is negative and significantly different from zero, the opposite of what we predicted, using the full sample of forecasts and is not significantly different from zero using the restricted sample. (We discuss this issue below.) In our findings, accuracy is negatively related to the forecast horizon and the number of industries followed, consistent with Clement and Tse (2003, 2005) and Malloy (2005). Accuracy is decreasing in forecast frequency for the full sample

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[6] We caution against making inferences from these differences because of multiple possible interpretations. For example, analysts who work for larger brokers likely receive higher compensation. If charterholders perform more strongly, then one might expect that charterholders are more likely to be employed by larger brokerage firms. But, the decision to obtain a CFA charter is not exogenous. The benefit of the CFA designation could be greater for analysts working at smaller brokers because these analysts cannot rely on the prestige of their employer as an alternative credential. This effect leads to a negative predicted relation. Attempts to distinguish between these alternative interpretations by modeling these differences are beyond the scope of the paper.

TABLE 2
Analyst Performance Regression Analysis

	Performance = Timeliness			Performance = Accuracy			Performance = Boldness			Performance = Optimism		
	Pred.	Full Sample (1)	Restricted Sample (2)	Pred.	Full Sample (3)	Restricted Sample (4)	Pred.	Full Sample (5)	Restricted Sample (6)	Pred.	Full Sample (7)	Restricted Sample (8)
Intercept	+	0.1385***	0.2376***	+	0.9243***	0.7619***	+	0.1835***	0.2796***	+	0.4466***	0.4927***
		(7.47)	(17.93)		(71.21)	(48.52)		(8.07)	(7.91)		(13.63)	(20.16)
CFAd	+	0.0064***	0.0153***	+	−0.0061***	−0.0001	+	0.0085***	0.0067***	−	0.0013	−0.0071**
		(11.13)	(3.80)		(−3.90)	(−0.05)		(9.12)	(3.71)		(0.36)	(−2.24)
Fcst Horizon	?	−0.0227	−0.0047	−	−0.5715***	−0.3941***	+	0.1080***	0.2116***	+	0.1257***	0.0439
		(−0.89)	(−0.16)		(−74.77)	(−14.79)		(3.07)	(15.03)		(2.99)	(1.16)
Broker Size	?	0.0244***	0.0673***	+	0.0039	0.0012	+	0.0253***	0.0346***	−	−0.0083***	−0.0104***
		(3.67)	(5.47)		(1.09)	(0.15)		(6.71)	(4.76)		(−2.82)	(−2.79)
Fcst Frequency	?	0.0121***	0.0349***	+	−0.0215***	0.0439***	+	0.0113***	0.0362***	?	−0.0047	−0.0190***
		(9.34)	(7.14)		(−6.25)	(9.68)		(4.72)	(5.12)		(−1.52)	(−2.65)
Firm Experience	?	0.0156***	0.0360***	+	0.0025	−0.0028	+	0.0227***	0.0184***	−	−0.0048*	0.0050
		(8.38)	(8.11)		(0.90)	(−0.46)		(16.89)	(2.95)		(−1.43)	(1.07)
Companies	?	0.0043**	0.0194***	−	−0.0055	0.0110	+	0.0136***	0.0080**	?	−0.0072**	−0.0063
		(2.21)	(2.60)		(−1.28)	(1.23)		(6.43)	(1.64)		(−2.28)	(−1.05)
Industries	?	−0.0001	0.0076***	−	−0.0105***	−0.0225***	−	0.0059***	0.0023	?	0.0021	0.0081
		(−0.09)	(2.62)		(−3.98)	(−6.31)		(3.19)	(0.46)		(0.51)	(1.51)
No. of Obs.		8,288	1,493		9,503	1,515		9,503	1,515		9,503	1,515
Adj. R^2 (%)		0.70	1.40		25.44	17.00		2.61	4.62		2.96	2.03

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Variables are defined in the Appendix.

This table reports the test results of the difference in performance between CFA charterholder and non-charterholder analysts. We estimate:

$$Performance_{ijkt} = \alpha + \beta CFAd_{ijkt} + \gamma Analyst\ Characteristics + \varepsilon_{ijkt}.$$

Performance takes on one of four dimensions: *Timeliness*, *Accuracy*, *Boldness*, and *Optimism*. The Full Sample includes all forecasts and the Restricted Sample includes only the last forecast issued by an analyst per firm year. We estimate regressions on a monthly basis and present the average value of the 84 monthly coefficients for the period of January 1, 1999 to December 31, 2005 as in Fama and MacBeth (1973). The number of observations is the average number of forecasts per month. Standard errors are calculated based on the monthly coefficients and are corrected for autocorrelation by the method of Newey and West (1987) with a lag of 12. Coefficient t-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise.

regression, which differs from the results in Clement and Tse (2003, 2005). When we restrict the sample to the last annual forecast in Column 4 as they do, the coefficient on forecast frequency is positive and consistent with their results.

In Columns 5 and 6 of Table 2, the coefficient on *CFAd* is positive and significantly different from zero, consistent with charterholders producing forecasts that are bolder than those of non-charterholders. We find that boldness is positively related to the forecast horizon, brokerage size, forecast frequency, firm experience, and number of companies followed, consistent with the research of Clement and Tse (2005). In our tests using the full sample, boldness is positively related to the number of industries followed. Although Clement and Tse (2005) find a negative empirical relation, they make no clear *ex ante* prediction for it.

In the last two columns, we find no evidence that optimism is different for charterholders using the full sample, but do find that charterholders are less optimistic than expected for the restricted sample. Consistent with studies by Kang et al. (1994) and Lim (2001), we find that optimism is positively related to forecast horizon and negatively related to brokerage size and firm experience. In our tests, optimism is negatively related to the number of companies followed.

We use two approaches to gauge the economic significance of our results. Using the full-sample results, in the first approach we compare our *CFAd* coefficient to the coefficient on broker size. Given that the broker size variable is standardized between 0 and 1, the coefficient on broker size represents the difference in performance of an analyst at one of the largest brokerage firms compared to an analyst at one of the smallest brokerage firms. In the case of the timeliness, the *CFAd* coefficient of 0.006 is about one-fourth the size of the 0.024 coefficient on broker size, which implies that moving from the smallest to the largest size brokerage firm is about four times as important as having a CFA charter. In the case of boldness, the coefficients imply that broker size is about three times as important as being a charterholder.

As another way of gauging economic significance, we use (1) the estimated coefficients from the regressions, (2) the mean standardized values of the control variables, and (3) the mean range and minimum values of the raw performance measure to calculate the predicted raw measure for charterholders and non-charterholders. For example, the predicted raw timeliness measure is 5.25 and 5.04 for charter and non-charterholders respectively, a difference of 4.1 percent.[7] In the case of boldness, if we follow a similar procedure, then charterholder forecasts deviate from the consensus by an average of 31.5 cents while non-charterholders deviate by about 30.6 cents. This difference of approximately 1 cent represents a 3.1 percent difference.[8]

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[7] As an illustration, recall from Equation (1) that timeliness is the ratio of leading days to following days. If one were to assume that the number of leading days is fixed at the unconditional sample mean, then the charterholders' (non-charterholders') timeliness ratio would translate into 7.01 (7.30) following days. That is, the "next" analyst would follow the charterholder slightly faster (3/10 of a day faster) than the "next" analyst would follow the non-charterholder.

[8] We also conduct some untabulated sensitivity analyses. First, to check if the analysts with extreme numbers of forecasts are driving the results, we rank all analysts in our sample by the number of forecasts they issue. We exclude the forecasts issued by analysts in the top 5 percent and the bottom 5 percent of this ranking and re-estimate Table 2. Although the magnitudes of coefficients are smaller, our inferences remain the same. Second, we examine if the charterholder advantage is different for up- versus down-market periods. We split observations into two groups in which the monthly market return is above or below the median monthly market return. We then re-estimate Table 2 for each group and find no differences between the *CFAd* coefficients.

Matched-Pair Tests and Results

In this section, we use a matched-pair design to test whether charterholders perform at higher levels than non-charterholders along the three dimensions of accuracy, boldness, and optimism. Our sample includes pairs of charterholder and non-charterholder forecasts that are issued: (1) on the same day, (2) for the same firm, and, (3) for the same fiscal period. Prior studies by Sinha et al. (1997), Clement (1999), Brown and Mohd (2003), and Clement and Tse (2005) document that controlling for these three factors strongly affects boldness, accuracy, and optimism tests. Given that the analysts forecast on the same day, they have access to the same public information sets. Controlling for the day of the forecast is particularly important because less-skilled analysts can simply wait a day and mimic the forecasts of more-skilled analysts.

Our measure of matched performance difference is created by subtracting the non-charterholder performance value from the charterholder performance value. If more than one charterholder (non-charterholder) issues a forecast of firm *j*'s fiscal period *k* earnings on the same day *t*, then we randomly choose one of the charterholders' (non-charterholders') forecast. This is the first matched-pair measure we use in our tests. Our second matched-pair measure uses the charterholder and non-charterholder residuals from a regression of the performance measure on the analyst characteristics instead of the performance measure itself. The residual from this regression is orthogonal to the analyst characteristics, thereby controlling for such characteristics. We expect that these matched-pair differences are positive for accuracy and boldness, and negative for optimism. Our matched-pair constraints restrict our sample to 68,825 matched-forecast pairs for 3,892 firms. Our inferences rely on the mean values of the performance differences.

Table 3, Panel A shows the mean differences are all in the predicted direction and statistically significant (albeit weakly for boldness and optimism), consistent with charterholders issuing more accurate, bolder, and less optimistic forecasts than non-charterholders, on average. In Panel B, after we control for analyst characteristics the results for accuracy, boldness, and optimism hold similar levels of significance. Non-parametric tests measuring the percentage of times the difference is in the intended direction are presented in both panels as corroborating evidence.

These matched-pair results for accuracy differ from the regression results above. The matched-pair results provide support for a charterholder advantage while the regression results using the full sample are consistent with a charterholder disadvantage. Since we match forecasts on the same day, the effect of timeliness is eliminated in the matched-pair tests. These different results support the idea that charterholders trade improved timeliness for reduced accuracy, as discussed by Cooper et al. (2001) and Schipper (1991), and shown by Shroff et al. (2005). To further support this intuition, in untabulated analysis we find that timeliness is negatively related to accuracy.

In sum, considering both the regression and matched-pair analyses, we find that while charterholders' forecasts are timelier, the results for accuracy are mixed. Charterholders' forecasts are more accurate if we control for the day of the forecast and less accurate if we do not. There is some evidence that charterholders act more boldly and less optimistically. These results provide support for our first hypothesis that charterholders achieve higher levels of performance relative to non-charterholders. The caveat is that although these documented differences between forecasts are often statistically significant, the differences are in the range of 4 percent or less, which implies that the economic significance of the differences is questionable.

TABLE 3
Analyst Performance Matched-Pair Difference Analysis

Panel A: No Controls for Analyst Characteristics[a]

	Pred.	Mean	t-statistic	Significance	% > 0	z-statistic	Significance
Accuracy Difference	+	0.0025***	4.17	<0.01	59.5**	1.75	0.04
Boldness Difference	+	0.0020*	1.42	0.08	53.6	0.66	0.26
Optimism Difference	−	−0.0020*	−1.50	0.07	35.7***	2.62	<0.01

Panel B: Controls for Analyst Characteristics[b]

	Pred.	Mean	t-statistic	Significance	% > 0	z-statistic	Significance
Accuracy Difference	+	0.0017**	2.17	0.02	56.0	1.09	0.14
Boldness Difference	+	0.0031**	1.95	0.03	58.3*	1.53	0.06
Optimism Difference	−	−0.0021*	−1.32	0.10	38.1**	2.18	0.01

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels respectively. Variables are defined in the Appendix.

This table reports the test results of the difference in forecast accuracy, boldness, and optimism between CFA charterholder and non-charterholder analysts. We estimate mean values on a monthly basis and present the average value of the 84 monthly means for the period of January 1, 1999 to December 31, 2005 as in Fama and MacBeth (1973). The average number of matched-pair observations per month is 819. Each pair includes one charterholder and one non-charterholder forecast issued on the same day, for the same firm, and the same fiscal period. Standard errors are calculated based on the monthly means and are corrected for autocorrelation by the method of Newey and West (1987) with a lag of 12. The last columns present the results for a nonparametric binomial test based on the monthly mean differences. Significance levels are based on one-tailed tests.

[a] Panel A uses the respective standardized performance measure to calculate differences.

[b] Panel B uses standardized performance measures that are orthogonal to the analyst characteristics. First, we estimate:

$$Performance_{ijkt} = \gamma_0 + \gamma_1 Broker\ Size_{ijkt} + \gamma_2 Fcst\ Frequency_{ijkt} + \gamma_3 Firm\ Experience_{ijkt} + \gamma_4 Companies_{ijkt} + \gamma_5 Industries_{ijkt} + \eta_{ikjt}.$$

Performance takes on one of three dimensions: *Accuracy*, *Boldness*, and *Optimism*. We then use the residual from this regression to calculate the matched-pair differences.

VI. PRE- AND POST-CFA CHARTERHOLDER PERFORMANCE TESTS

In this section we test our second and third hypotheses, which attempt to determine if the charterholder performance advantage is attributable to human-capital or signaling theories of education. We rely on tests using timeliness and accuracy, our primary measures of performance.

These tests use a different sample from those reported earlier. First, for those analysts classified as charterholders, we search through all their reports available on Investext to determine the date they begin to include the CFA mark after their names, which should be soon after they receive their charter. We exclude charterholders who enter the sample period having already obtained their CFA designations because we do not have a pre-CFA period for these analysts. Second, to control for the effects of experience as an analyst, we match each charterholder with a non-charterholder who enters and exits the sample in the same years as the charterholder. For example, if the charterholder is included in our sample for three years prior to attaining the charter, then these three years are considered his/her pre-period. The matched non-charterholder will have the same three years designated as the pre-period. Third, to control for the effects of broker size, we pick a matched non-charterholder who is employed by a broker that is closest in size to the charterholder's employer in the first year the charterholder appears in the sample. Last, we extend the sample to earlier periods and include forecasts made as early as 1995. This is important because we need a pre-CFA period that provides enough forecasts to allow comparisons with the post-CFA period. After these restrictions, we identify 519 matched-analyst pairs.[9]

Our regression tests include indicator variables for the pre- and post-CFA periods along with a similar set of controls for analyst characteristics as in Equation (1). We estimate:

$$\begin{aligned} Performance_{ijkt} = \alpha &+ \beta_1 CFAd_{ijkt} + \beta_2 Post + \beta_3 Post \times CFAd_{ijkt} \\ &+ \gamma Analyst\ Characteristics + \varepsilon_{ijkt}. \end{aligned} \tag{2}$$

Post is an indicator variable that equals 1 if analyst *i* issues a forecast in the post period, and 0 otherwise. In this specification, the intercept represents the performance of the non-charterholder in the pre-CFA period. The β_1 coefficient represents the difference between charterholders and non-charterholders in the pre-CFA period. A positive β_1 coefficient provides evidence that charterholders achieve higher levels of performance even before they obtain their charter, consistent with signaling theory. The β_3 coefficient on the *Post* × *CFAd* interaction captures the change in performance that charterholders experience from the pre to the post period relative to non-charterholders. A positive β_3 coefficient provides evidence that charterholders achieve relatively higher levels of performance in the post period, consistent with human-capital theory.

Handling the years just prior to attainment of the CFA charter is a challenge. At this point, future charterholders have started the CFA program. If part of the CFA-associated difference is because charterholders acquire new skills, then we risk falsely attributing a forecast by a charterholder in the pre-period to his/her innate ability instead of to the learning acquired from the CFA program. This difficulty in attributing forecasts to either theory of education is more of an issue for pre-CFA forecasts produced closer in time to the charter award because the analyst has spent more time in the CFA program. Our solution is to exclude forecasts immediately prior to attainment of the CFA charter. However, as we start to exclude forecasts in the pre-CFA period, the power of our tests diminishes. Given this trade-off, we present our results in two ways: excluding the one-year period and the three-year period immediately prior to attaining the CFA charter.

Table 4 summarizes our results.[10] We first discuss analyst timeliness. In Column 1, the coefficient on *CFAd* is positive and statistically significant, while in Column 2 this coefficient is not significantly different from zero. Given that the forecasts immediately before the attainment of the CFA charter are hard to attribute to human capital or signaling theories and the lack of results when we exclude forecasts issued three years before attaining the CFA charter, we make no inference about the role of signaling in explaining why charterholders are more timely than non-charterholders.

In the case of the *Post* × *CFAd* interaction, the coefficient on this variable is positive and statistically significant in both Columns 1 and 2, although weakly so in Column 2.

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[9] Untabulated descriptive statistics show that for this sample there are no significant analyst characteristic differences between charterholders and non-charterholders. The exception is that charterholders cover modestly more industries than non-charterholders.

[10] In untabulated analysis we estimate a specification as in Equation (1) that excludes the *Post* and *Post* × *CFAd* variables but for the revised sample. These results produce identical inferences about charterholders to the Table 2 full-sample results. The coefficients are similar in sign, magnitude, and significance.

TABLE 4
Pre- and Post-CFA Analyst Performance Analysis

	Performance = Timeliness			*Performance = Accuracy*		
	Pred.	**Sample Excludes One Year before CFA Charter (1)**	**Sample Excludes Three Years before CFA Charter (2)**	**Pred.**	**Sample Excludes One Year before CFA Charter (3)**	**Sample Excludes Three Years before CFA Charter (4)**
Intercept	+	0.1386***	0.1352***	+	0.9132***	0.9269***
		(9.32)	(8.16)		(90.04)	(84.41)
CFAd	+	0.0057**	0.0040	+	−0.0095	−0.0156
		(2.22)	(0.76)		(−1.02)	(−1.12)
Post	?	−0.0045**	0.0003	?	0.0034	−0.0086
		(−2.16)	(0.07)		(0.50)	(−0.92)
Post × *CFAd*	+	0.0053**	0.0070*	+	0.0020	0.0081
		(2.25)	(1.39)		(0.20)	(0.58)
Fcst Horizon	?	−0.0149	−0.0159	−	−0.5550***	−0.5565***
		(−0.69)	(−0.72)		(−51.22)	(51.30)
Broker Size	?	0.0337***	0.0340***	+	0.0058**	0.0048*
		(5.47)	(5.23)		(2.00)	(1.65)
Fcst Frequency	?	0.0121***	0.0121***	+	−0.0274***	−0.0268***
		(7.22)	(6.78)		(−5.30)	(−5.28)
Firm Experience	?	0.0104***	0.0093***	+	0.0078**	0.0069*
		(4.38)	(3.80)		(1.85)	(1.61)
Companies	?	0.0042***	0.0047***	−	−0.0103***	−0.0110***
		(2.48)	(2.67)		(−3.87)	(−3.99)
Industries	?	0.0023	0.0017	−	−0.0105***	−0.0107***
		(0.91)	(0.63)		(−3.19)	(−2.70)
No. of Obs.		2,849	2,605		3,125	2,868
Adj. R^2 (%)		0.89	0.90		27.03	27.13

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels respectively. Variables are defined in the Appendix.

This table reports the test results of the difference in performance between 519 CFA charterholders matched with non-charterholder analysts. We estimate the following:

$$Performance_{ijkt} = \alpha + \beta_1 CFAd_{ijkt} + \beta_2 Post + \beta_3 Post \times \mathrm{CFAd}_{ijkt} + \gamma Analyst\ Characteristics + \varepsilon_{ijkt}.$$

Performance is either *Timeliness* or *Accuracy*. We present results excluding forecasts issued in the one-year period and the three-year period immediately prior to attaining the CFA charter. We estimate regressions on a monthly basis and present the average value of the 132 monthly coefficients for the period of January 1, 1995 to December 31, 2005 as in Fama and MacBeth (1973). The number of observations is the average number of forecasts per month. Standard errors are calculated based on the monthly coefficients and are corrected for autocorrelation by the method of Newey and West (1987) with a lag of 12. Coefficient t-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise.

Regardless of whether the pre-period forecasts are attributed to human capital or signaling theories, this increase between the pre- and post-CFA period relative to non-charterholders is consistent with a human-capital explanation for why charterholders are more timely. As an additional comment, in the primary analysis in Section V we cannot rule out the possibility that the CFA effect could be driven by unobserved characteristics of analysts, such as age or education. While these effects could explain differences in the pre-CFA period, these factors would not affect the change in timeliness relative to a non-charterholder over the pre- and post CFA periods.

Turning to our tests of accuracy, the coefficients on *CFAd* and the *Post* × *CFAd* interaction are not significantly different from zero in both columns. This is not surprising given the mixed results for accuracy in our primary analysis in Section V.[11] In summary, we find evidence of human capital theory explaining the CFA difference for timeliness, but neither theory explaining a difference in accuracy.

VII. ADDITIONAL ANALYSIS: THE ROLE OF INVESTORS

Based on the previous analyses, the role of a signaling theory of education is unclear. In this section, we continue to investigate the role of signaling in an alternative setting. Traditional signaling models are about an employer who decides which candidate to hire without knowing the ability of the candidate, but with the ability to observe his or her education level. However, a great deal of public and objective information is available about analysts, such as their historical and current forecasts about many firms, and employers may condition their employment decisions on this other non-CFA information. In a similar spirit, Riley (2001) concludes that the signaling value of education will be less important in sectors in which performance is easy to measure.[12]

For these reasons, we expect that the signaling demand for the CFA designation will arise mainly from investors rather than employers. Investors deal with a large set of analysts and do not have the same incentives as employers to systematically monitor and evaluate individual analysts. Although the public information on analysts is extensive, collecting, aggregating, and processing this information is nontrivial. While sophisticated investors could have more precise expectations of an analyst's ability, there are always less sophisticated or new investors who have imprecise or no prior information about the analyst's ability. The highly visible placement of the CFA mark following the analyst's name in reports to investors is consistent with charterholders' desire to advertise this trait.[13] Our argument is similar to the idea of "credentialism" as put forward by Lazear (1977), who argues that customers will use the credentials of the professional as a signal in assessing the professional's service quality. The research on credentialism is limited. Tucker (1987), using a coarse proxy for the demand for credentialism, finds no support for it.

We use the market's price reaction to forecasts issued by analysts with a CFA designation to determine whether investors condition on the CFA designation. If signaling demand for the designation is from investors, then the market should react more strongly to forecasts issued by charterholders after we control for performance. We estimate various specifications of:

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[11] In untabulated analysis we estimate Equation (2) using our secondary measures of performance, *Boldness* and *Optimism*. For boldness, we find that the *CFAd* coefficient is positive and statistically significant for both samples, although weakly significant for the sample that excludes forecasts issued three years prior to attaining the CFA charter. The coefficient on *Post* × *CFAd* interaction is not significant for either sample. For optimism, the coefficients on *CFAd* and the *Post* × *CFAd* interaction are not significant for either sample.

[12] Analysts' decisions to obtain the CFA charter could be guided by the signaling value to companies that employed them *prior* to their becoming analysts or by the expected signaling value to *future* employers if they change careers. For example, when analysts decided to obtain their CFA designation in the past, they could have been employed in a sector where performance is more private (e.g., they work for an industrial firm). If they are currently employed as sell-side analysts, they could consider whether the CFA designation would help them were they to pursue other occupations.

[13] Based on our experience in reading analyst names as identified on their research reports, except for the rare qualifications of CPA, Ph.D., or M.D., the CFA mark is often the only item that appears after a name.

$$\begin{aligned} CAR_{ijkt} = {} & \delta_1 Revision_{ijkt} + \delta_2 Revision_{ijkt} \times CFAd_{ijkt} + \delta_3 Revision_{ijkt} \\ & \times Timeliness_{ijkt} + \delta_4 Revision_{ijkt} \times Boldness_{ijkt} + \delta_5 Revision_{ijkt} \\ & \times Accuracy_{ijkt} + \delta_6 Revision_{ijkt} \times Optimism_{ijkt} + \varepsilon_{ijkt}. \end{aligned} \tag{3}$$

CAR_{ijkt} is size-adjusted returns for firm *j* cumulated over the three-day window centered on analyst *i*'s forecast of firm *j*'s fiscal period *k* earnings issued on day *t*. We winsorize those observations with size-adjusted returns in the top and bottom 1 percent of the distribution. $Revision_{ijkt}$ equals analyst *i*'s I/B/E/S EPS forecast of firm *j*'s fiscal period *k* earnings on day *t* less analyst *i*'s previous forecast of firm *j*'s fiscal period *k* earnings, with this difference scaled by the standard deviation of all forecasts of firm *j*'s fiscal period *k* earnings issued prior to day *t*.[14] In this specification, all explanatory variables are interacted with forecast revisions because our research question focuses on explaining the relation between forecast revisions and returns. Our results are insensitive to including all explanatory measures as additional variables in the regression or to controlling for analyst characteristics. We also include firm-year fixed effects to control for differences in returns that are due to firm and time effects, which have been shown to affect the relation between returns and forecast revisions. The sample for these tests is limited to observations with data available to measure all variables. The total number of forecasts used for this test is 489,209 for 3,790 firms, which consists of 139,884 forecasts made by 852 charterholders and 349,325 forecasts made by 2,487 non-charterholders.

Table 5 reports the results of estimating various specifications of Equation (3). The first column excludes the controls for performance and shows that the market reacts more strongly to charterholder forecasts. This result is consistent with the idea that forecasts issued by charterholders contain more information. It also provides triangulating evidence with our previous results that charterholders perform at modestly higher levels than non-charterholders. The second column includes the full model. The market reaction is increasing in timeliness, boldness, and accuracy and decreasing in optimism, consistent with studies by Cooper et al. (2001), Gleason and Lee (2003), and Park and Stice (2000). Interestingly, timely and bold forecasts seem to have an effect that is an order of magnitude larger than that of accuracy and optimism, consistent with the independence of analysts' information being more important to investors than the actual processing of the information into precise or unbiased forecasts. More importantly, the coefficient on *Revision* × *CFAd* remains positive and statistically significant, which shows that performance measures do not subsume the charterholder effect.[15]

In terms of economic significance, using the Column 2 results the non-charterholders' revision coefficient is 1.36 while the charterholders' incremental revision coefficient is 0.21. This implies that, after controlling for the common measures of analyst performance, the

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[14] As in Stickel (1992) and Malloy (2005), we set standard deviation values less than \$0.25 equal to \$0.25 to mitigate the effect of small denominators, and scaled forecast revisions are truncated at −200 percent and +200 percent.

[15] We conduct the following untabulated sensitivity analyses. First, it is possible that the best analysts are assigned to follow firms where earnings are the most uncertain, which could bias the results given that we scale revisions by the standard deviation of analyst forecasts. We split observations into two groups, those with below and above the median standard deviation of forecasts, and re-estimate Table 5. Coefficient differences between the two groups are inconsequential and these results are robust to this effect. Second, the results hold if we instead use cumulative abnormal returns multiplied by market capitalization. We also perform similar sensitivity analyses to those discussed in Section V. If we exclude those analysts (the top and bottom 5 percent) with extreme numbers of forecasts, our inferences are the same. We also find that the coefficients on *Revision* × *CFAd* are modestly stronger for down than for up markets.

TABLE 5
Market Reaction to CFA Charterholders' Forecasts

	Pred.	Full Sample (1)	Full Sample (2)	Small Firms (3)	Large Firms (4)
Intercept	?	−0.0480*	−0.0467*	0.0110	−0.1045***
		(−1.43)	(−1.41)	(0.15)	(−3.27)
Revision	+	3.0576***	1.3587***	2.0493***	0.6170***
		(20.54)	(6.97)	(7.63)	(3.02)
Revision × *CFAd*	+	0.2519***	0.2115***	0.3590**	0.0509
		(3.00)	(2.71)	(2.37)	(0.82)
Revision × *Timeliness*	+		3.8175***	3.9778***	3.6143***
			(14.46)	(11.32)	(8.00)
Revision × *Boldness*	+		2.5645***	2.3139***	2.2794***
			(6.87)	(5.84)	(5.23)
Revision × *Accuracy*	+		0.3830**	0.4558**	0.4265*
			(2.13)	(2.27)	(1.65)
Revision × *Optimism*	−		−0.3350*	−0.4430*	0.1012
			(−1.49)	(−1.61)	(0.42)
No. of Obs.		5,824	5,824	2,914	2,910
Adj. R^2 (%)		4.24	5.29	6.50	4.13

***, **, * Indicate significance at the 1 percent, 5 percent, and 10 percent levels respectively. Variables are defined in the Appendix.

This table reports the test results of the difference in the market reaction between CFA charterholder and non-charterholder analysts. We estimate various specifications of the following:

$$CAR_{ijkt} = \delta_1 Revision_{ijkt} + \delta_2 Revision_{ijkt} \times CFAd_{ijkt} + \delta_3 Revision_{ijkt} \times Timeliness_{ijkt} + \delta_4 Revision_{ijkt} \times Boldness_{ijkt} + \delta_5 Revision_{ijkt} \times Accuracy_{ijkt} + \delta_6 Revision_{ijkt} \times Optimisim_{ijkt} + \varepsilon_{ijkt}.$$

Columns 1 and 2 use the full sample of forecasts. Columns 3 and 4 present the results for samples of forecasts issued about firms below and above the median firm size. We estimate regressions on a monthly basis and present the average value of the 84 monthly coefficients for the period of January 1, 1999 to December 31, 2005 as in Fama and MacBeth (1973). The number of observations is the average number of forecasts per month. Standard errors are calculated based on the monthly coefficients and are corrected for autocorrelation by the method of Newey and West (1987) with a lag of 12. Coefficient t-statistics are in parentheses. Significance levels are based on one-tailed tests where there is a prediction for the sign of the coefficient and based on two-tailed tests otherwise.

charterholder's market reaction is about 15 percent greater than that for non-charterholders. Given that the mean positive and negative revision in our sample is about 0.03 and −0.15, respectively, the market reaction is about 0.66 percent (0.22 * 0.03) more positive and 3.30 percent (0.22 * −0.15) more negative for charterholders.

This 15 percent difference in market reaction for charterholders is larger than the percentage differences in performance measures such as timeliness and boldness established above. We investigate whether these results are driven by smaller firms. Stickel (1992) and Malloy (2005) show that firm size is related to the return response to forecast revisions. In Columns 3 and 4, we partition the sample into forecasts for firms that are smaller and larger, respectively, than the median firm in terms of market capitalization. The regression coefficient on *Revision* × *CFAd* is positive and statistically significant in Column 3, while it is not significant in Column 4. This implies that charterholders' market-reaction effect is greatest for smaller firms, which represent a less economically important group of firms.

Overall, these results are consistent with investors in smaller firms placing part of the weight on the observed performance measures (such as timeliness, accuracy) and part of the weight on the CFA designation because they both proxy for analysts' true performance with error. These results provide support for the notion that the CFA designation acts as a signal to investors and that a professional's credentials are important to their clients.

VIII. CONCLUSION

This study compares the performance of sell-side equity analysts with and without a CFA designation. Using a large sample of forecasts, our tests indicate that CFA charterholders issue forecasts that are timelier than those of non-charterholders. The results for accuracy are mixed. There is some evidence that charterholders act more boldly and less optimistically. While we establish that charterholders perform at statistically significant higher levels than non-charterholders in some tests, the economic significance of these differences is questionable.

For a subsample of analysts, we are able to measure charterholders' performance both before and after obtaining their CFA charter. This allows us the opportunity to provide unique tests of human-capital and signaling theories. We find evidence that charterholders improve along the dimension of timeliness after they receive their charter. This result provides support for a human-capital explanation, in which charterholders improve their productivity during the CFA program.

Last, we show that the market reaction for smaller firms is stronger for charterholders after controlling for timeliness, boldness, accuracy, and optimism. This result provides evidence consistent with "credentialism," a variant of signaling theory in which a professional's education level provides a signal about the professional's quality to his or her clients.

A caveat of our analysis is that the decision to obtain a charterholder is complex, and in our paper this decision is unmodeled. We caution readers that in our primary tests the charterholder difference we document could be influenced by unobserved characteristics of analysts such as age or education.

APPENDIX
VARIABLE DEFINITIONS

Variable	Definition
Standardized[a]	
Timeliness	= $\textit{Leading Days}_{ijkt}/\textit{Following Days}_{ijkt}$, where $\textit{Leading Days}_{ijkt}$ ($\textit{Following Days}_{ijkt}$) equals the total number of days between analyst *i*'s forecast of firm *j*'s fiscal period *k* earnings issued on day *t* and the two most recent preceding (following) forecasts of firm *j*'s fiscal period *k* earnings by any other analyst.
Boldness	= $\lvert \textit{Fcst EPS}_{ijkt} - \textit{Consensus EPS}_{jkt} \rvert$, where $\textit{Fcst EPS}_{itj}$ is analyst *i*'s I/B/E/S forecast of firm *j*'s fiscal period *k* earnings on day *t* and $\textit{Consensus EPS}_{jkt}$ is the mean of all analysts' most recent forecasts of firm *j*'s fiscal period *k* earnings issued during the 90-day period prior to day *t*.
Accuracy	= $\lvert \textit{Fcst EPS}_{ijkt} - \textit{Actual EPS}_{jk} \rvert \times -1$, where $\textit{Fcst EPS}_{itj}$ is analyst *i*'s I/B/E/S forecast of firm *j*'s fiscal period *k* earnings on day *t* and $\textit{Actual EPS}_{jk}$ is the actual amount announced by firm *j* for fiscal period *k* as reported by I/B/E/S.

Optimism = *Fcst* EPS_{ijkt} − *Actual* EPS_{jk}, where *Fcst* EPS_{itj} is analyst *i*'s I/B/E/S forecast of firm *j*'s fiscal period *k* earnings on day *t* and *Actual* EPS_{jk} is the actual amount announced by firm *j* for fiscal period *k* as reported by I/B/E/S.

Fcst Horizon = time from the forecast date to the end of the fiscal period, calculated as the number of days from analyst *i*'s forecast on day *t* to firm *j*'s fiscal period *k* end date.

Broker Size = analyst's brokerage size, calculated as the number of analysts employed by the brokerage firm employing analyst *i* in the 12-month period prior to day *t*.

Fcst Frequency = analyst's forecast frequency, calculated as the total number of firm *j* forecasts for fiscal period *k* made by analyst *i*.

Firm Experience = analyst's firm-specific experience, calculated as the number of years from the first forecast day of firm *j* earnings by analyst *i* to day *t*.

Companies = number of companies covered by the analyst, calculated as the number of companies followed by analyst *i* in the 12-month period prior to day *t*.

Industries = number of industries covered by the analyst, calculated as the number of unique two-digit SICs of all the companies followed by analyst *i* in the 12-month period prior to day *t*.

Not Standardized

CFAd = indicator variable that equals 1 if analyst *i* is a CFA charterholder, and 0 otherwise.

Post = indicator variable that equals 1 if analyst *i* issues a forecast in the post period, and 0 otherwise.

CAR = size-adjusted returns for firm *j* cumulated over the three-day window centered on analyst *i*'s forecast of firm *j*'s fiscal period *k* earnings issued on day *t*. Size-adjusted returns equal firm raw returns less the CRSP size-matched decile index returns.

Revision = analyst *i*'s I/B/E/S EPS forecast of firm *j*'s fiscal period *k* earnings on day *t* less analyst *i*'s previous forecast of firm *j*'s fiscal period *k* earnings, with this difference scaled by the standard deviation of all forecasts of firm *j*'s fiscal period *k* earnings issued prior to day *t*.

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[a] Standardized variables are adjusted to range from 0 to 1 using a transformation that maintains the relative distances among each variable's measures for firm *j* in fiscal year *k*. The scaled variables for analyst *i* on day *t* take the form:

$$\text{Standardized Variable}_{ijkt} = \frac{\text{Raw Variable}_{ijkt} - \text{Raw Variable min}_{jk}}{\text{Raw Variable max}_{jk} - \text{Raw Variable min}_{jk}}.$$

Raw Variable max_{jk} and Raw Variable min_{jk} are the original maximum and minimum values respectively of a characteristic for firm *j*'s fiscal year *k*.

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Hurdle Rates and Project Development Efforts

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ABSTRACT: We examine the optimal choice of hurdle rates in a capital budgeting setting in which a manager receives superior information regarding the profitability of an investment project. Unlike the prior capital budgeting literature that treats the distribution of investment returns as exogenous, we consider a scenario in which the manager can engage in upfront project development activities to improve the quality of investment opportunity. To motivate the project development effort while ensuring truthful information flow, the optimal hurdle rate is always lower than what it would be if the manager's project development effort were directly observable. We show that the optimal hurdle rate can even be below the firm's cost of capital under plausible circumstances. We also examine how the optimal hurdle rate varies with the *ex ante* quality of the firm's investment opportunities, and find that optimal hurdle rates will be higher in firms whose investment opportunities are relatively good or relatively poor than in firms with investment opportunities of intermediate quality.

Keywords: *capital budgeting; hurdle rate; project development effort; investment opportunity set.*

I. INTRODUCTION

Capital budgeting, or investment appraisal, is arguably one of the most critical and challenging management tasks in business organizations. One approach that seems prevalent in practice is that firms set *hurdle rates*, or minimum rates of return, that investment projects are required to meet in order to receive funding. Empirical evidence suggests a great deal of variation across firms in their choices of hurdle rates.[1] For instance, Poterba and Summers (1995) survey CEOs at *Fortune* 1000 companies and find that the reported hurdle rates exhibit considerable variation across the respondent firms. They find

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[1] There is only limited empirical evidence on firms' choices of hurdle rates. A major problem is that internal hurdle rates are rarely available in the public domain. Instead, researchers often have to rely on surveys of company managers.

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that, even though the average hurdle rate appears to be relatively high, a significant proportion of the respondent firms used hurdle rates that were *lower* than their costs of capital.[2] Their findings also show that, even within the same firm, hurdle rates often vary in a wide range as a function of the type of investment projects.[3] These empirical findings seem to suggest that the internal capital allocation process is more complex than that presumed in the extant theoretical literature.

The standard textbook solution advocates that, in order to maximize shareholder value, a firm should set investment hurdle rate equal to its actual cost of capital (Brealey and Myers 2000; Young and O'Byrne 2001). This prescription is predicated on the presumption that shareholders and managers share identical objectives and are symmetrically informed about their firms' investment opportunities. In contrast, the capital budgeting literature based on agency theory presumes that self-interested managers have goals different from those of shareholders, and possess superior information about their firms' investment opportunities. These models show that with managerial private information, the second-best mechanisms entail capital rationing; i.e., optimal hurdle rates exceed actual costs of capital (Antle and Eppen 1985; Harris and Raviv 1996).[4] While these models provide a potential explanation for capital rationing, they do not explain all of the variation observed in firms' choices of internal hurdle rates. For instance, this literature fails to explain why hurdle rates are sometimes *lower* than firms' true costs of capital. There is a need to enrich capital budgeting models in order to explain the choice of internal hurdle rates that can evidently vary from capital rationing to capital leniency.

We develop a model in which a self-interested manager receives private information about a potential investment opportunity. The manager also exerts an unobservable level of general operational effort to increase the firm's cash flows from its existing assets. One of the limiting features of the extant agency-theoretic models of capital budgeting is that firms' investment opportunities are assumed to be entirely exogenous. We relax this assumption and presume that the manager can exert a personally costly effort to develop the investment opportunity *before* he learns its true profitability. The project's expected returns are increasing in the level of upfront project development effort exerted by the manager. Such project development activities play a crucial role in many capital investment contexts. Frequently, managers must exert considerable effort in conceiving and developing investment projects before they can assess the viability of these projects with reasonable accuracy. For example, prior to the submission of investment proposals on developing new products or entering new markets, extensive effort is necessary to formulate ideas and identify potential customers.

After the manager has exerted his project development effort and received information regarding the project's profitability, he reports his private information to the firm's owner who then decides whether to fund the project. Since the owner cannot independently verify the project's viability nor monitor the manager's efforts, she must rely on her choice of hurdle rate and managerial compensation plan to generate desirable managerial incentives. Our analysis shows that the manager's incentives to exert project development effort are decreasing in the owner's choice of hurdle rate. As a consequence, the optimal hurdle rate is lower than what it would be if the manager's project development effort could be directly dictated. Furthermore, consistent with the findings of Poterba and Summers (1995), we show that the optimal hurdle rate can be below the owner's cost of capital under plausible circumstances. Our analysis also characterizes how the optimal hurdle rate varies with the *ex ante* quality of the firm's investment opportunities, and find that optimal hurdle rates will be lower for intermediate quality projects than for extreme (low or high) quality projects.

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[2] According to Figure 3 in Poterba and Summers (1995), more than 25 percent of the respondent firms set hurdle rates lower than their costs of capital.

[3] See Figure 2 in Poterba and Summers (1995).

[4] Antle and Fellingham (1997) and Rajan and Reichelstein (2004) provide excellent reviews of this literature.

To understand our findings, consider first a "standard" capital budgeting setting in which the firm's investment opportunity set is exogenous and hence the manager does not contribute any project development effort. After privately learning the project's return, the manager reports his private information to the owner. The manager has an incentive to understate the project's return because it allows him to exert less general purpose effort and ascribe the resulting poor performance to low investment returns. To counteract this incentive, the owner must pay the manager informational rents. Since the manager can benefit from misreporting the project's returns only if the project is undertaken, the manager earns these informational rents only if the project is approved. To economize on the manager's informational rents, the owner forgoes marginally profitable projects by imposing a hurdle rate that exceeds her true cost of capital.

In our model, however, the manager must be provided with incentives not only to report information truthfully, but also to improve the quality of the investment opportunity through his project development efforts. While managerial informational rents are often viewed as private benefits that accrue to self-interested managers at the expense of the firm, they serve a useful incentive role in our model; that is, they provide the manager with incentives to exert project development effort. Since the manager earns informational rents only when the project is undertaken, a lower hurdle rate increases the likelihood that the manager enjoys the benefits of project approval. As a consequence, the manager's incentives to contribute project development effort are decreasing in the hurdle rate chosen by the owner.

The optimal choice of hurdle rate balances the owner's conflicting objectives of minimizing managerial compensation and providing desirable project development incentives. Consequently, the optimal hurdle rate is lower than what it would be if the project development effort were directly observable. We identify plausible circumstances under which the optimal hurdle rate is actually *below* the firm's cost of capital. We also find that the optimal hurdle rate is non-monotonic in the quality of the firm's investment opportunity set. To understand this result, note that the owner finds it desirable to set a lower hurdle rate because it increases the manager's incentives to engage in personally costly project development activities. As the *ex ante* project quality becomes relatively poor or relatively good, however, the manager's choice of project development effort becomes relatively insensitive to the hurdle rate. Our analysis thus predicts that optimal hurdle rates will be higher in firms whose investment opportunity sets are relatively good or relatively poor than in firms whose investment opportunity sets are of intermediate quality. To the extent that a firm's historical performance proxies for the *ex ante* quality of its investment opportunities, our analysis predicts that hurdle rates will be higher in firms with "extreme" performance than in firms with "average" performance.

We also consider a decentralized setting in which the investment decision is delegated to the manager. In the delegated setting, the manager is no longer required to report his private information to the owner. Instead, the optimal effort and investment decisions must be induced through a proper choice of managerial performance measure. Our analysis shows that a linear compensation contract based on residual income can generate optimal effort and investment incentives, provided that the capital charge rate is based on the firm's optimal hurdle rate.

Our analysis is related to the literature on capital budgeting under asymmetric information. The list includes Harris et al. (1982), Antle and Eppen (1985), Holmstrom and Costa (1986), Bernardo et al. (2001), Baldenius (2003), Baldenius et al. (2007), Dutta and Reichelstein (2002), and Dutta (2003). These papers show that when the manager has private information about the project's profitability, the second-best hurdle rate is higher than the cost of capital. These models, however, assume that the distribution of project returns is exogenous and do not consider the possibility that the manager, through his project development activities, can affect the distribution of investment returns. In our model, the return distribution is endogenous in that the manager's choice of project development effort affects the project's expected profitability.

Laffont and Tirole (1993) and Baiman and Rajan (1998) also consider settings in which the agent's private information is endogenous. Laffont and Tirole (1993) outline a procurement model in which a regulated firm can commit some investment to reduce the expected value of its future production costs and examine how the possibility of such non-contractible investment changes the regulator's choice of cost-reimbursement rule.[5] Baiman and Rajan (1998) examine the optimal choice of cost standards for a production agent who can invest in skill acquisition activities to enhance his future cost efficiency. Their analysis identifies a trade-off between inducing skill acquisition activities and production efforts. While our analysis and these two studies share the modeling feature that the agent's type is endogenous, our article is quite different from these two studies in terms of its research focus and other modeling choices.

The remainder of the article is organized as follows. Section II describes the economic setting. Section III first characterizes the optimal choice of hurdle rate in a benchmark setting in which the distribution of investment returns is exogenously specified. It then examines the choice of optimal hurdle rate when the manager can exert project development effort to stochastically enhance investment returns. Section IV concludes.

II. MODEL

We model a one-period principal-agent relationship between a firm's risk-neutral owner (principal) and its risk-neutral manager (agent). The period begins at date 0 and ends at date 1. At the beginning of the period, the firm has access to a potentially profitable project. Undertaking this project requires an initial cash outlay of k dollars at date 0, and generates cash inflow of $(1 + r) \cdot k$ dollars at date 1. Therefore, r denotes the project's rate of return. The end-of-period cash flow to the firm is given by:

$$c = k \cdot (1 + r) \cdot I + a, \tag{1}$$

where $I \in \{0,1\}$ is an indicator variable that denotes whether the project is undertaken, and a denotes the manager's unobservable choice of effort. We note that managerial effort a improves the firm's cash flow regardless of its investment choice I. For this reason, and also to distinguish it from the project development effort discussed below, a will be referred to as general operational effort.

The owner seeks to maximize the net present value of the firm's cash flow net of compensation payment to the manager, s:

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[5] Laffont and Tirole (1993, 86–92).

$$\gamma \cdot [k \cdot (1 + r) \cdot I + a - s] - k \cdot I.$$

Here, $\gamma \equiv (1 + r_f)^{-1}$ is the firm's discount factor and r_f is the cost of capital, which in our risk-neutral setting equals the risk-free rate. To simplify notation, we normalize the risk-free rate r_f to zero, and hence the project's NPV is simply equal to $k \cdot (1 + r) - k = k \cdot r$.

A key feature of our model is the notion that many investment projects, such as launching new products or entering new markets, require extensive development efforts in formulating plans and identifying new customers. The expected payoff from such a project is likely to depend on the level of development effort undertaken prior to its implementation. To model this, we assume that the rate of return r is increasing in the level of project development effort undertaken by the manager. In particular, the project's rate of return r is given by:

$$r = e + \mu + \varepsilon, \tag{2}$$

where e denotes the level of project development effort chosen by the manager, μ represents the *ex ante* quality of the firm's investment opportunities, and $\varepsilon \in (-\infty,\infty)$ is the realization of a zero mean random variable. While the manager's choice of e is not observable to the owner, the quality of the firm's investment opportunity set, μ, is a commonly known parameter. It is also common knowledge that the random variable ε is drawn from a distribution $F(\varepsilon)$ with positive density $f(\varepsilon)$ on the whole real line. We assume that the density function $f(\cdot)$ is unimodal and symmetric around zero and is at least twice continuously differentiable throughout its support.[6] Furthermore, we assume that $F(\cdot)$ satisfies the usual monotone inverse hazard rate condition; i.e., $H(\varepsilon) \equiv [1 - F(\varepsilon)]/f(\varepsilon)$ is decreasing in ε. The monotone inverse hazard rate condition is satisfied by many common distributions such as uniform, normal, exponential, and gamma (Bagnoli and Bergstrom 2005).

In our model, the manager exerts two types of efforts: (i) project development effort $e \in [0,\bar{e}]$, and (ii) general operational effort $a \in [0,\bar{a}]$. The manager is effort-averse and his disutilities of project development effort e and operational effort a are given by $v(e) = \frac{v}{2} \cdot e^2$ and $w(a) = \frac{w}{2} \cdot a^2$, respectively, with $v > 0$ and $w > 0$. The risk-neutral manager's net utility (net payoff) is therefore given by:

$$V = s - v(e) - w(a). \tag{3}$$

The manager has no personal funds of his own. This limited wealth constraint prevents the owner from selling the firm to the manager.

At the beginning of the period, the manager decides whether to accept the contract offered by the owner. If the manager accepts the contract, he chooses the level of project development effort e. Subsequently, the manager privately observes the project's rate of return r and submits his report $\tilde{r}$ to the owner. In response to the manager's report, the owner makes the investment decision according to the pre-committed investment policy.

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[6] The assumption of a symmetric and unimodal distribution is only used in the proof of Proposition 5, and is not required for any other result.

Finally, the manager contributes operational effort a and the end-of-period cash flow is realized. This sequence of events is depicted in the time line in Figure 1.

A key set of assumptions of our analysis are that (i) the manger cannot be prevented from quitting after observing r, and therefore the manager's participation constraints must be satisfied not only on *ex ante* basis (i.e., in expectation over r), but also on interim basis for each realized value of r, and (ii) the owner commits to an incentive scheme at the very outset. That is, the owner designs and commits to an incentive scheme at the outset such that the manager finds it in his interest to stay with the firm for each realized value of r. Given that the manager is intimately involved with the development of the project, it is reasonable to presume that the manager is essential for its successful implementation. If the project were to disappear with the manager, then the owner would then have endogenous incentives to design a compensation scheme such that each type of manager would stay with the firm.

Notice that the owner can only observe the aggregate cash flow in Expression (1), but not its individual components related to returns from investment and general operational effort a. The owner's inability to observe the individual components of the aggregate cash flow, combined with the manager's private information regarding the project's rate of return r, creates an agency problem that prevents the owner from achieving the first-best outcomes. Specifically, in our model, the manager has a natural incentive to shirk on his operational effort and ascribe the resulting poor performance to low investment returns.

III. OPTIMAL HURDLE RATES

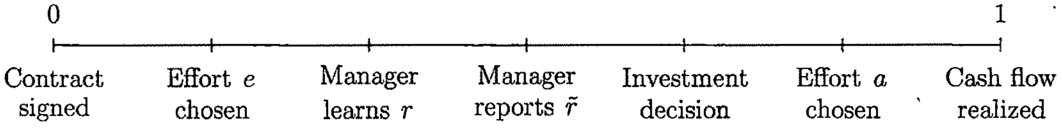
Benchmark Setting

First, we examine the optimal choice of hurdle rate in a benchmark setting in which the project development effort e is an exogenous parameter. The manager submits a report $\tilde{r}$ about the project's rate of return to the owner after the owner has committed to an incentive plan for the manager. Given the revelation principle, we consider only incentive plans that induce the manager to reveal his information truthfully. A managerial incentive plan specifies the manager's compensation $s(\tilde{r})$, the required performance $c(\tilde{r})$ (measured in terms of the end-of-period cash flow), and the investment decision rule $I(\tilde{r})$, all as functions of the manager's report $\tilde{r}$.

When the project's true rate of return is r but the manager reports $\tilde{r}$, let $a(\tilde{r},r)$ denote the minimum amount of general-purpose effort that the manager must expend to generate cash flow consistent with his report $\tilde{r}$. That is:

$$a(\tilde{r},r) \equiv \min\{a|k \cdot (1 + r) \cdot I(\tilde{r}) + a \geq c(\tilde{r})\} = c(\tilde{r}) - k \cdot (1 + r) \cdot I(\tilde{r}). \tag{4}$$

FIGURE 1
Time Line



It will be convenient to define:

$$U \equiv s - w(a).$$

That is, U denotes the agent's interim utility net of his cost of operational effort a, but before the disutility of project development effort e. Contingent on the reported return of $\tilde{r}$ and the true return of r, the manager's *ex post* utility becomes:

$$U(\tilde{r},r) = s(\tilde{r}) - w(a(\tilde{r},r)).$$

Let $U(r)$ denote the manager's utility when he reports his private information truthfully; that is:

$$U(r) \equiv U(r,r).$$

Similarly, define $a(r) \equiv a(r,r)$. Given the definition in Equation (4), a managerial incentive plan can be equivalently represented by the triplet $\{I(\tilde{r}), a(\tilde{r}), s(\tilde{r})\}$.

The firm owner's problem becomes:[7]

$$\mathbf{P}_0: \max_{\{I(\cdot),a(\cdot),s(\cdot)\}} \int_{-\infty}^{\infty} [k \cdot r \cdot I(r) + a(r) - s(r)] \cdot dF(r - e - \mu)$$

subject to:

(i) $U(r) \geq U(\tilde{r},r)$ for all r and $\tilde{r}$,
(ii) $U(r) \geq 0$ for all r.

The above optimization problem is a standard adverse selection problem. Its objective function reflects the expected value of the owner's payoff that equals the end-of-period cash flow net of compensation payment to the manager. The incentive compatibility constraints in (i) ensure that the manager finds it in his self interest to report his private information truthfully. The participation constraints in (ii) guarantee that the manager will earn at least his reservation utility, which has been normalized to zero without loss of generality.

We note that, in the absence of a hidden action problem associated with operational effort a, the manager would have no incentive to misrepresent his private information, since he is indifferent toward all investment policies. Because of the underlying hidden effort problem, however, the manager has a natural incentive to understate the project's rate of return. By understating the project's profitability, the manager can deliver the same level of performance with less exertion of personally costly effort.

To counteract the manager's incentives to understate the project's rate of return, the owner must provide the manager with informational rents. The basic trade-off for the owner is that the manager's informational rents will be increasing both in the induced effort level, a, as well as the set of states in which the project is undertaken. To focus on the main intuition of the model, we assume that the manager's operational effort is sufficiently valuable so that the owner always finds it optimal to induce the maximum level of effort, i.e., $a(r) \equiv \bar{a}$ for all r. This requires that $w \cdot \bar{a} << 1$; that is, the marginal cost of operational effort at the maximum level of effort $\bar{a}$, $w \cdot \bar{a}$, is sufficiently small relative to the marginal benefit of effort, which, in our model, has been normalized to 1.[8]

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[7] Since both parties are risk-neutral, all of our results would continue to hold if the terminal cash flows were subject to an additional random noise term; i.e., $c = k(1 + r)I + a + \eta$ with $E(\eta) = 0$. See Laffont and Tirole (1986).

Applying the standard arguments from the adverse selection literature based on "local" incentive compatibility constraints, it can be shown that the manager's informational rent takes the form:[9]

$$U(r) = k \cdot w \cdot \bar{a} \cdot \int_{-\infty}^{r} I(u)du. \tag{5}$$

This local first-order condition combined with the monotonicity requirement that $I(r)$ is non-decreasing (i.e., the investment policy is upper-tailed) ensures that the mechanism is globally incentive compatible. Equation (5) shows that if the owner approves the project, then the manager will earn more than his reservation utility of zero (i.e., the manager will earn informational rent). Furthermore, it shows that the compensation scheme must be structured so that the manager's informational rent increases at the rate of $k \cdot w \cdot \bar{a}$ in the project's rate of return (in the range of states in which the project is undertaken; that is, when $I(r) = 1$). In the absence of such increasing informational rents schedule, the manager would have an incentive to understate r so that he can shirk on the personally costly operational effort a.

Using integration by parts, the expected informational rent becomes:

$$E[U(r)] = k \cdot w \cdot \bar{a} \cdot \int_{-\infty}^{\infty} [1 - F(r - e - \mu)] \cdot I(r)dr. \tag{6}$$

The owner's maximization problem thus simplifies to:

$$\mathbf{P}_1: \max_{I(\cdot)} \int_{-\infty}^{\infty} [r - H(r - e - \mu) \cdot w \cdot \bar{a}] \cdot k \cdot I(r) \cdot dF(r - e - \mu).$$

Since the above optimization problem must be solved subject to the monotonicity constraint that $I(r)$ is non-decreasing, the owner's choice of investment decision rule $I(\cdot)$ simply amounts to choosing a hurdle rate h^0 such that the project is approved if and only if $r > h^0$.

Lemma 1: It is optimal to approve the project if and only if its rate of return exceeds a hurdle rate h^0 which satisfies $h^0 > 0$ and solves the equation:

$$h^0 = H(h^0 - e - \mu) \cdot w \cdot \bar{a}. \tag{7}$$

Proof: All proofs are in the Appendix.

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[8] In the absence of this assumption, the optimal choice of managerial operational effort a will generally depend on the reported value of r because the owner will use both $a(r)$ and $I(r)$ to limit the manager's informational rents. While the analysis becomes considerably more complex, the qualitative nature of our main results remains virtually unchanged.

[9] See the proof of Lemma 1 in the Appendix for details.

Consistent with the findings of Antle and Eppen (1985), Lemma 1 shows that the owner approves the investment project only if its return exceeds a hurdle rate h^0 that exceeds her true cost of capital (normalized to zero). Capital rationing arises because the owner faces a trade-off between maximizing investment payoffs and minimizing managerial rents. To see this more explicitly, note that the owner needs to pay informational rents only if she approves the project. Therefore, the owner can reduce her expected compensation cost by reducing the set of states for which she approves the project. Such a strategy is costly, however, because the owner forgoes some positive net present value investments. The optimal choice of hurdle rate balances the owner's objectives of maximizing investment returns, while minimizing the expected compensation payment to the manager.

The result below characterizes how the optimal hurdle rate varies with the quality of the firm's investment opportunity set.

Proposition 1: The optimal hurdle rate, h^0, is increasing in the quality of the firm's investment opportunity set, μ.

To understand the intuition behind this result, note that, for a given hurdle rate, an increase in μ increases the number of states in which the project is approved and hence increases the manager's informational rents. The owner thus optimally adjusts the hurdle rate upward to curtail informational rents.

Under the hurdle rate mechanism identified above, Equation (5) implies that the manager's compensation can be written as:

$$s(r) = w(\bar{a}) + k \cdot w \cdot \bar{a} \cdot \max\{0, r - h^0\}. \tag{8}$$

The first term on the right-hand side is the manager's compensation for his disutility of operational efforts. The second term represents the manager's informational rent, which increases linearly in r when $r > h^0$. The contract in Equation (8) can therefore be interpreted as consisting of a fixed salary component of $w(\bar{a})$ and $k \cdot w \cdot \bar{a}$ "options" each with a strike price of h^0. This option contract interpretation will be helpful in understanding the intuition behind some of our results in the next subsection.[10]

Main Setting

We now consider our main setting in which the project development effort e is endogenously chosen by the manager. Ideally, to motivate project development effort, managerial compensation should be linked to the project's realized rate of return r. In our model, however, r is unobservable and nonverifiable by the firm, and therefore managerial compensation cannot directly depend on r.

In making the investment decision, the owner must rely on the privately informed manager's report about the project's rate of return. As the preceding analysis shows, however, this enables the manager to earn informational rents. To ensure that the manager reports his private information truthfully, the manager's informational rents must increase in the project's rate of return r at the rate of $k \cdot w \cdot \bar{a}$ (in the range of states in which the project is undertaken). This implies that the higher is the project's rate of return r, the higher will be the amount of rents extracted by the manager. As a consequence, the manager has a natural incentive to exert personally costly effort e because it enhances the expected value of r. Therefore, managerial informational rent provides the firm with an indirect benefit through its incentive effect on the manager's choice of project development effort e.

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[10] We thank an anonymous referee for suggesting the option contract representation in Equation (8).

We again focus on the scenario in which the manager's operational effort is sufficiently valuable so that the owner seeks to induce the maximum level of operational effort $\bar{a}$. In choosing an optimal incentive scheme, the owner now also has to take into account the manager's incentive constraint for the project development effort e:

$$\mathbf{P}_2\text{:}\quad \max_{\{I(\cdot),e(\cdot),s(\cdot)\}} \int_{-\infty}^{\infty} [k \cdot r \cdot I(r) + \bar{a} - s(r)] \cdot dF(r - e - \mu)$$

subject to:

(i) $U(r) \geq U(\tilde{r},r)$ for all r and $\tilde{r}$;
(ii) $U(r) \geq 0$ for all r;
(iii) $\int_{-\infty}^{\infty} U(r) \cdot dF(r - e - \mu) - v(e) \geq 0$; and
(iv) $e = \underset{\tilde{e}}{\operatorname{argmax}} \int_{-\infty}^{\infty} U(r) \cdot dF(r - \tilde{e} - \mu) - v(\tilde{e})$.

In addition to the manager's truth-telling constraints in (i) and the interim participation constraints in (ii), an optimal incentive scheme must also satisfy the manager's *ex ante* participation constraint in (iii), and the incentive constraint for the project development effort in (iv). We note that the truth-telling constraints in (i) ensure that, regardless of his previous choice of project development effort e, the manager finds it in his self-interest to report the project's rate of return truthfully for each realized value of r.[11]

Constraints (i) and (ii) in program $\mathbf{P}_2$ require that the manager's informational rents must satisfy Equation (5). Furthermore, we note that the *ex ante* participation constraint in (iii) is automatically satisfied given the interim participation constraints in (ii).[12] Therefore, after substituting for the manager's expected utility from Equation (6), the owner's optimization problem simplifies to:

$$\max_{\{I(r),e\}} \int_{-\infty}^{\infty} [r - H(r - e - \mu) \cdot w \cdot \bar{a}] \cdot k \cdot I(r) \cdot dF(r - e - \mu)$$

subject to:

$$e = \underset{\tilde{e}}{\operatorname{argmax}} \int_{-\infty}^{\infty} k \cdot w \cdot \bar{a} \cdot [1 - F(r - \tilde{e} - \mu)] \cdot I(r) \cdot dr - v(\tilde{e}).$$

As before, the manager's truth-telling constraints require that the above optimization program must be solved subject to the monotonicity constraint that $I(r)$ is non-decreasing; i.e., the investment policy must be upper-tailed. Given this constraint, the owner's choice of investment decision rule $I(r)$ simply amounts to choosing a hurdle rate h such that the project is approved if and only if its rate of return exceeds h. Therefore, the owner's optimization problem can be equivalently stated as follows:

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[11] The manager's cost of project development effort $v(e)$ is sunk at the reporting stage, and is therefore irrelevant for his reporting incentives.

[12] To see this, note that since the manager can leave the firm at any time, his informational rent is non-negative for each realization of r. Hence, even when $e = 0$, the manager's *ex ante* expected utility is greater than his reservation utility of zero.

$$\mathbf{P}_3\colon \max_{\{h,e\}} \int_h^\infty [r - H(r - e - \mu) \cdot w \cdot \bar{a}] \cdot k \cdot dF(r - e - \mu)$$

subject to:

$$e = \operatorname*{argmax}_{\tilde{e}} \int_h^\infty k \cdot w \cdot \bar{a} \cdot [1 - F(r - \tilde{e} - \mu)] \cdot dr - v(\tilde{e}). \tag{9}$$

As discussed in connection with Lemma 1, the owner's choice of hurdle rate has two distinct impacts on her expected payoff. As the hurdle rate increases above the cost of capital, the owner's expected profit decreases because some positive NPV projects are rejected. At the same time, since the manager earns informational rents only if the project is approved, the manager's informational rents decrease as the hurdle rate increases. In the benchmark setting, the manager's project development effort is exogenous and hence the optimal hurdle rate balances these two conflicting effects. When the project development effort must be induced endogenously, however, an increase in the hurdle rate has an additional effect on the owner's expected payoff. The manager's incentives to exert personally costly project development effort decreases as the hurdle rate increases because a higher hurdle rate reduces the probability that the project will be subsequently approved.

To solve $\mathbf{P}_3$, we first examine how the manager's choice of return enhancing effort e changes with the hurdle rate. Given a hurdle rate h, the manager will choose his project development effort e to maximize the objective function in Equation (9). The first term of the manager's objective function represents the expected value of managerial informational rents, whereas the second term is the manager's disutility of project development effort. To ensure that the manager's objective function is concave in e, we impose the following assumption:[13]

Assumption A1: $\max f(\cdot) < \frac{v}{2 \cdot k \cdot w \cdot \bar{a}}$.

Given A1, the manager's incentive compatibility constraint with regard to his choice of e can be replaced with its first-order condition:

$$k \cdot w \cdot \bar{a} \cdot [1 - F(h - e - \mu)] = v \cdot e. \tag{10}$$

In choosing the level of project development effort e, the manager equates the marginal return from increasing e, $k \cdot w \cdot \bar{a} \cdot [1 - F(h - e - \mu)]$, to its marginal cost, $v \cdot e$. To interpret the marginal return from increasing the project development effort e, it is instructive to refer back to the "option" contract representation in Equation (8). Under this interpretation, the manager receives $k \cdot w \cdot \bar{a}$ options each with a strike price of h and hence his utility takes the form:

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[13] This assumption ensures that the marginal cost of project development effort increases at a sufficiently high rate so that the manager's objective function is globally concave. It can be verified that a weaker condition, namely $\max f(\cdot) < \frac{v}{k \cdot w \cdot \bar{a}}$, suffices to ensure the concavity of the manager's objective function in Equation (9). The stronger condition in Assumption A1 is imposed to ensure that the owner's objective function is also well behaved; i.e., it is single-peaked in h when evaluated at the induced choice of project development effort $e(h)$. See the proof of Proposition 3 for details.

$$U(r) = k \cdot w \cdot \bar{a} \cdot \max\{0, r - h\}.$$

The manager's marginal return from increasing the project development effort is therefore equal to the probability that his options end-in-the-money (i.e., $[1 - F(h - e - \mu)]$) times the number of options (i.e., $k \cdot w \cdot \bar{a}$).

Let $e(h)$ denote the manager's optimal choice of project development effort as a function of h. We have the following results:

Proposition 2: The manager's choice of project development effort e decreases in the hurdle rate h.

To understand the intuition behind this result, it is again useful to refer to the option contract representation of managerial compensation. A decrease in the hurdle rate amounts to decreasing the strike price of the manager's options. We note that decreasing the strike price of the manager's options increases the probability that the manager's options end-in-the-money (i.e., decreasing h increases $[1 - F(h - e - \mu)]$), and thus increases the manager's marginal return from e. Since the marginal cost of project development effort is independent of the hurdle rate, the manager responds by increasing the level of project development effort.

Having characterized the manager's optimal response $e(h)$, we now turn to the owner's choice of hurdle rate. For a given hurdle rate h, let $\Pi(h, e(h))$ denote the owner's expected payoff evaluated at the manager's optimal response $e(h)$; that is:

$$\Pi(h, e(h)) \equiv \int_h^\infty [r - H(r - e(h) - \mu) \cdot w \cdot \bar{a}] \cdot k \cdot dF(r - e(h) - \mu).$$

Differentiating with respect to h yields:

$$\frac{d\Pi}{dh} = \frac{\partial \Pi(h, e(h))}{\partial h} + \frac{de(h)}{dh} \cdot \frac{\partial \Pi(h, e(h))}{\partial e}. \tag{11}$$

The above equation illustrates that an increase in the hurdle rate has two different effects on the owner's expected profit. The first-term on the right-hand side of Equation (11), $\frac{\partial \Pi}{\partial h}$, reflects the hurdle rate's "direct" effect and captures the familiar tension between curtailing managerial informational rents and enhancing investment efficiency for a given e. If the project development effort e were exogenous, as assumed in the benchmark setting examined earlier, then the optimal hurdle rate would be given by the solution of the equation $\frac{\partial \Pi}{\partial h} = 0$.

In addition to this direct effect, an increase in the hurdle rate impacts the owner's expected payoff indirectly through the manager's incentives to contribute project development effort. This "indirect" effect is represented by the second term on the right-hand side of Equation (11). Proposition 2 shows that $\frac{de(h)}{dh} < 0$, i.e., a higher hurdle rate leads to a lower level of project development effort. Since $\frac{\partial \Pi}{\partial e}$ is always positive, the indirect effect of increasing the hurdle rate on the owner's expected profit Π is always negative. The first-order condition for the optimal hurdle rate h^* is given by:

$$\frac{\partial \Pi(h^*, e(h^*)}{\partial h} + \frac{de(h^*)}{dh} \cdot \frac{\partial \Pi(h^*, e(h^*))}{\partial e} = 0. \tag{12}$$

Assumption A1 guarantees that $\Pi(\cdot)$ is a single-peaked function of h, and therefore the above first-order condition is also sufficient. Let $e^* \equiv e(h^*)$ denote the project development effort induced by h^*.

Proposition 3: There exists a unique solution $\{h^*, e^*\}$ to the optimization program $\mathbf{P}_3$. Furthermore, $h^* < h^0(e^*)$, i.e., the optimal hurdle rate is strictly lower than what it would be if the manager's project development effort were directly observable.

The optimal choice of hurdle rate balances the owner's objectives of (i) maximizing expected investment payoffs *net* of managerial informational rents, and (ii) providing project development incentives to the manager. If there were no moral hazard problem regarding the manager's choice of e, then the owner would have to concern herself only with objective (i) above. Since the project development effort has to be endogenously induced, however, the owner has to take into account that the manager's project development incentives are decreasing in the hurdle rate. Consequently, the optimal hurdle rate in the presence of managerial effort incentive problem is lower than what it would be in the absence of such an incentive problem; that is, $h^* < h^0(e^*)$.

The result below discusses how the optimal project development effort e^* changes with parameters of the model.

Proposition 4: The optimal project development effort e^* is decreasing in $\frac{v}{k}$ for all μ. Furthermore, $0 < e^* < \frac{k \cdot w \cdot \bar{a}}{v}$ with $\lim_{\mu \to -\infty} e^* = 0$, and $\lim_{\mu \to \infty} e^* = \frac{k \cdot w \cdot \bar{a}}{v}$.

To gain intuition for why e^* decreases in $\frac{v}{k}$, it is helpful to note that $\frac{v}{k}$ represents the firm's cost-benefit ratio of project development effort. To see this, note that the project's net present value is equal to $k \cdot r$, the scale of investment times the project's rate of return. The scale of investment thus amplifies the effect of project development effort e on the firm's investment payoffs. Since v indexes the manager's cost of project development effort, $\frac{v}{k}$ can be considered as a measure of the firm's cost-benefit ratio of the project development effort. As this cost-benefit ratio becomes more favorable, the owner finds it optimal to induce a higher level of project development effort.

Figure 2 depicts the relationship between the optimal level of project development effort e^* and μ for two different values of cost-benefit ratio. It shows that e^* approaches zero as μ becomes small and approaches $\frac{k \cdot w \cdot \bar{a}}{v}$ as μ grows large. Furthermore, for each μ, the optimal project development effort e^* is higher for $\frac{v}{k} = \frac{1}{500}$ than for $\frac{v}{k} = \frac{1}{300}$.

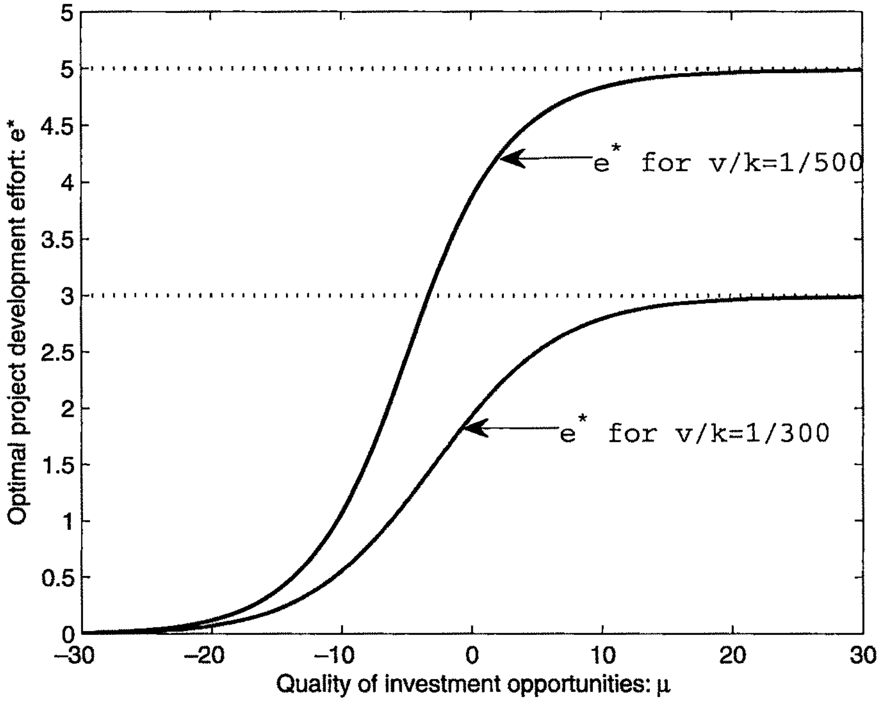
We recall that the optimal hurdle rate in the benchmark setting, $h^0(e)$, is above the firm's cost of capital for each value of e, and is monotonically increasing in μ, the quality of the firm's investment opportunity set. Since $h^* < h^0(e^*)$, a natural question is whether the optimal hurdle rate h^* can ever be below the firm's cost of capital. It is also interesting to examine how the optimal hurdle rate varies with the quality of the firm's investment opportunities.

Proposition 5: If $\frac{v}{k}$ is sufficiently small, then:

(i) As a function of μ, the optimal hurdle rate h^* achieves its lowest value when μ is neither too low nor too high.

(ii) The optimal hurdle rate h^* is less than the firm's cost of capital for all $\mu \in (\mu_1,\mu_2)$, where $-\infty < \mu_1 < \mu_2 < \infty$.

FIGURE 2
Optimal Project Development Effort and Quality of Investment Opportunities



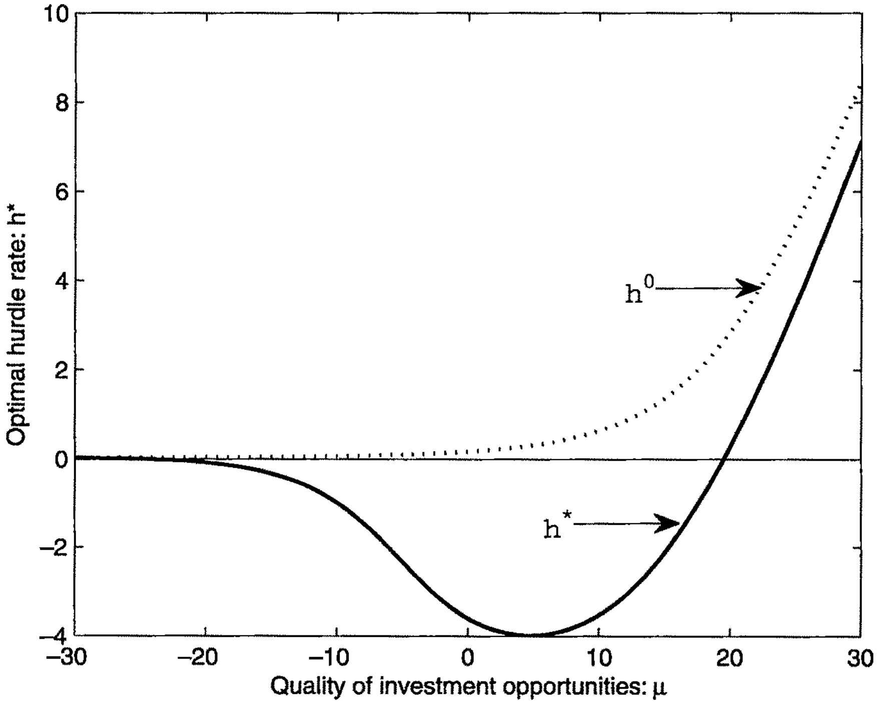
To generate this figure, we assume that $w \cdot \bar{a} = 0.01$ and $\varepsilon \sim N(0,100)$.

Unlike the benchmark setting in which the optimal hurdle rate is increasing in the prior quality of the firm's investment opportunity set, Proposition 5 shows that the optimal hurdle rate is generally non-monotonic in μ. In particular, this result shows that optimal hurdle rates will be lower in firms with "medium" quality investment opportunities than in firms with investment opportunities of relatively extreme (low or high) quality. Furthermore, Proposition 5 shows that the optimal hurdle rate is *below* the firm's cost of capital provided that the quality of the firm's investment opportunity set is neither too low nor too high.

This relationship between h^* and μ is depicted by the solid curve in Figure 3. For each μ, we also calculate $h^0(e^*)$, the optimal hurdle rate if the managerial effort could be directly dictated to be e^*, and plot it as the dashed line in Figure 3. While the optimal hurdle rate in the benchmark setting, $h^0(e^*)$, is monotonically increasing in the prior quality of investment opportunities μ, the optimal hurdle rate in the presence of project development effort incentive problem is non-monotonic in μ. The optimal hurdle rate h^* approaches $h^0(e^*)$ as μ becomes more extreme (small or large). In contrast, the difference between the optimal hurdle rate h^* and $h^0(e^*)$ is relatively large for intermediate values of μ. Furthermore, Figure 3 shows that h^* is below the firm's cost of capital for each μ in $[\mu_1,\mu_2]$.

To understand the intuition behind this result, note that the owner finds it optimal to reduce the hurdle rate below $h^0(e^*)$ because a lower hurdle rate increases the manager's

FIGURE 3
Optimal Hurdle Rate and Quality of Investment Opportunities



To generate this figure, we assume that $w \cdot \bar{a} = 0.01$, $\frac{v}{k} = 0.002$, and $\varepsilon \sim N(0,100)$.

incentives to provide project development effort. However, the manager's choice of project development effort becomes relatively insensitive to the owner's choice of hurdle rate as the *ex ante* quality of investment opportunity becomes relatively extreme; that is, $\frac{\partial e}{\partial h}$ becomes small as μ approaches $-\infty$ or ∞. This is why the gap between h^* and $h^0(e^*)$ shrinks as μ approaches ∞. As μ approaches $-\infty$, the gap between h^* and $h^0(e^*)$ shrinks even faster because the project development effort is not only more difficult to motivate through a lowering of the hurdle rate, but it is also relatively less valuable to the owner because the project is almost surely to be rejected.[14]

In contrast, the optimal hurdle rate h^* is lower for intermediate values of μ for two different reasons. First, the manager's project development effort e is relatively more important to the owner for these "medium" quality investment opportunities; that is, $\frac{\partial \Pi}{\partial e}$ is relatively high for intermediate values of μ. Put differently, a "booster shot" in the form of upfront project development effort is relatively more valuable for these intermediate quality investment opportunities. Second, the manager's informational rent, and hence his choice of project development effort, is also more sensitive to a change in the hurdle rate h for these medium quality projects (i.e., the absolute value of $\frac{\partial e}{\partial h}$ is relatively high for intermediate values of μ).

To the extent that one can find a suitable proxy, Proposition 5 generates testable implications on the relationship between a firm's choice of hurdle rate and the *ex ante* quality of its investment opportunity set. In particular, Proposition 5 implies that hurdle rates will be higher in firms whose investment opportunities are relatively good or relatively poor than in firms with investment opportunities of intermediate quality. If investment opportunities remain relatively stable over time, then one possible proxy for the quality of a business unit's investment opportunities might be its historical performance. Our result in Proposition 5 then suggests that, controlling for other factors, we would find that investment hurdle rates are higher for divisions with "extreme" performance than for divisions with "average" performance.

To conclude this section, we examine a delegated investment setting in which the manager is not required to report his private information to the owner. Instead, the owner hands over the investment decision to the manager. To ensure that the manager makes the desirable investment decision and exerts the optimal amount of operational and project development efforts, the owner compensates the manager on the basis of a suitable performance measure. We consider linear compensation contracts of the form:

$$s = \alpha + \beta \cdot \pi, \tag{13}$$

where α denote the manager's fixed salary, β is the manager's bonus parameter, and π is the managerial performance measure. A performance measure is said to be optimal if there exist coefficients (α,β) such that the linear compensation contract in Equation (13) satisfies the manager's participation constraints, and generates the same expected payoff for the owner as the optimal incentive plan under the centralized setting.

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[14] Recall that the hurdle rate's "indirect" effect on the owner's expected profit depends on the product of $\frac{\partial e}{\partial h}$ and $\frac{\partial \Pi}{\partial e}$. As μ approaches $-\infty$, both $\frac{\partial e}{\partial h}$ and $\frac{\partial \Pi}{\partial e}$ become small.

Residual income has recently received considerable attention in the literature. Unlike operating income, which does not charge for the use of capital, residual income has the advantage that the owner can tailor the *capital charge rate* so that the manager internalizes her investment objectives. In our one-period model, operating income equals net cash flow $a + k \cdot r \cdot I$. Consequently, residual income corresponding to the capital charge rate of $\hat{r}$ becomes:

$$RI = a + (r - \hat{r}) \cdot k \cdot I. \tag{14}$$

Proposition 6: Residual income based on the capital charge rate of h^* constitutes an optimal performance measure.

Equation (14) shows that the manager will adopt the optimal project acceptance decision provided the capital charge rate is set equal to the optimal hurdle rate h^*. Furthermore, the manager will exert the maximum level of operational effort $\bar{a}$ if the manager's bonus parameter β equals his marginal cost of effort $w \cdot \bar{a}$. An appropriate choice of the fixed salary α then ensures that when the investment project is undertaken, the linear contract of the form in Equation (13) will provide the manager with a total compensation of $w(\bar{a}) + k \cdot w \cdot \bar{a} \cdot \max\{0,(r - h^*)\}$, which is equal to his compensation from the optimal incentive scheme under the centralized setting. Consequently, the manager has incentives to exert the optimal amount of project development effort e^*.

IV. CONCLUSION

We have examined the optimal choice of hurdle rates in an agency-theoretic capital budgeting setting. Unlike the prior literature that treats the firm's investment opportunity set as exogenous, we focus on a scenario in which the firm's manager can exert personally costly effort to improve the expected quality of the investment project available to the firm. We show that the optimal hurdle rate is always lower than what it would be if the manager's project development effort were not subject to moral hazard. While the "standard" agency-theoretic model of capital budgeting predicts that the optimal hurdle rate is always above the firm's cost of capital, our analysis identifies plausible circumstances under which it can be optimal to set the hurdle rate *below* the firm's cost of capital. We also investigate how the optimal hurdle rate varies with the quality of the firm's investment opportunity set. Our results shed light on the empirical findings of Poterba and Summers (1995) who document that hurdle rates exhibit considerable variation across firms.

Our analysis suggests several new avenues for future research. One possibility is to extend our analysis to a multidivisional setting in which divisions compete for scarce investment capital.[15] It would be interesting to investigate how interdivisional competition for capital would affect divisional managers' incentives to undertake project development activities. One might expect that competition for capital would motivate managers to enhance average qualities of their divisions' investment opportunities. However, such competition would also reduce the amount of expected informational rent extracted by any given manager, which would have a dampening effect on managers' project development incentives.

Our analysis has focused on a scenario in which the manager's effort influences the project's expected rate of return, but has no impact on the quality of information that the manager subsequently receives about the project. In future research, it might be interesting to examine settings in which the manager can exert effort to increase the informativeness of his signal about the project's profitability. In a first-best setting, the owner would clearly prefer a more informative signal as it would lead to a more efficient investment decision. With asymmetric information, however, a more informative signal also implies a greater severity of the adverse selection problem and hence higher informational rents for the manager. It would be interesting to examine how the optimal hurdle rate in such a setting would differ from the predictions of standard adverse selection models.

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[15] See Baldenius et al. (2007) for an analysis of this capital budgeting problem under the assumption that divisional investment opportunities are exogenous.

APPENDIX
PROOF OF LEMMA 1

The manager's utility payoff contingent on the true probability parameter r and the reported $\tilde{r}$ can be written as:

$$U(\tilde{r},r) \equiv s(\tilde{r}) - w(a(\tilde{r},r)), \tag{15}$$

where $a(\tilde{r},r) = c(\tilde{r}) - k \cdot (1 + r) \cdot I(\tilde{r})$ denotes the effort level that the manager has to exert in order to generate cash flows consistent with his report $\tilde{r}$. It can be shown with standard techniques that any incentive compatible mechanism has to satisfy the following "local" condition:

$$\frac{d}{dr} U(r) = \frac{\partial}{\partial r} U(\tilde{r},r)|_{\tilde{r}=r}.$$

Differentiating Equation (15) with respect to r gives:

$$\frac{\partial}{\partial r} U(\tilde{r},r)|_{\tilde{r}=r} = k \cdot w'(a(r)) \cdot I(r),$$

where $a(r) \equiv a(r,r) = c(r) - k \cdot (1 + r) \cdot I(r)$. Since the participation constraint $U(r) \geq 0$ will hold with equality for the lowest type (i.e., $U(-\infty) = 0$), the above equation implies that the manager will earn the following informational rents:

$$U(r) = \int_{-\infty}^{\infty} k \cdot w'(a(u)) \cdot I(u)du. \tag{16}$$

Using the expression in (16) to solve for the compensation payments and integrating by parts yield:

$$\int_{-\infty}^{\infty} s(r)dF(r - e - \mu)$$
$$= \int_{-\infty}^{\infty} [w(a(r)) + H(r - e - \mu) \cdot k \cdot w'(a(r)) \cdot I(r)] \cdot dF(r - e - \mu).$$

Consequently, the owner's objective in $\mathbf{P}_0$ simplifies to the following optimization problem:

$$\max_{\{I(r),a(r)\}} \int_{-\infty}^{\infty} \{a(r) - w(a(r)) + [r - w'(a(r)) \cdot H(r - e - \mu)] \cdot k \cdot I(r)\} \cdot dF(r - e - \mu).$$

The above objective function can be maximized pointwise. Clearly, $I(r) = 0$ if $r \leq 0$. If $I(r) = 1$, the owner will choose $a(r)$ to maximize:

$$a(r) - w(a(r)) - H(r - e - \mu) \cdot w'(a(r)) \cdot k.$$

Since $H(\cdot)$ is decreasing, it will be optimal to choose $a(r) = \bar{a}$ whenever $I(r) = 1$ provided that $w \cdot \bar{a}$ is sufficiently small relative to one. A sufficient condition for this is given by:

$$w \cdot \bar{a} < 1 - k \cdot w \cdot H(-e - \mu).$$

We assume that the above condition holds. As a consequence, the owner will choose the investment policy $I(r)$ to maximize:

$$\int_{-\infty}^{\infty} [r - w \cdot \bar{a} \cdot H(r - e - \mu)] \cdot k \cdot I(r) \cdot dF(r - e - \mu).$$

By pointwise maximization, it follows that the owner will choose $I(r) = 1$ if and only if $r \geq h^0$, where the hurdle rate h^0 is given by:

$$h^0 = w \cdot \bar{a} \cdot H(h^0 - e - \mu).$$

To complete the proof, it needs to be shown that the above incentive scheme is globally incentive compatible. As shown by Mirrlees (1971), a mechanism is incentive compatible provided it is locally incentive compatible, and $\frac{\partial}{\partial r} U(\tilde{r},r)$ is (weakly) increasing in $\tilde{r}$. For the above mechanism:

$$\frac{\partial}{\partial r} U(\tilde{r},r) = w'(a(\tilde{r},r)) \cdot k \cdot I(\tilde{r}),$$

which is increasing in $\tilde{r}$ since $w'(\cdot)$ is increasing, $a(\tilde{r},r)$ is (weakly) increasing in $\tilde{r}$ and the optimal $I(\cdot)$ is an upper-tail investment policy. ■

Proof of Proposition 1

By the implicit function theorem:

$$\frac{dh^0}{d\mu} = \frac{-w \cdot \bar{a} \cdot H'(h^0 - e - \mu)}{1 - w \cdot \bar{a} \cdot H'(h^0 - e - \mu)}.$$

Since $H'(\cdot) < 0$ by assumption, we have $\frac{dh^0}{d\mu} > 0$. ■

Proof of Proposition 2

Let $\overline{V} = \mathrm{E}[U(r)|e] - \frac{v}{2}e^2$ denote the manager's *ex ante* expected utility, i.e., expected informational rents net of the cost of project development effort. The manager chooses his project development effort to maximize $\overline{V}$. Given that:

$$\mathrm{E}[U(r)|e] = \int_h^\infty k \cdot w \cdot \overline{a} \cdot [1 - F(r - e - \mu)]dr,$$

the first-order condition for the manager's maximization problem in choosing e becomes:

$$\frac{d\overline{V}}{de} = k \cdot w \cdot \overline{a} \cdot [1 - F(h - e - \mu)] - v \cdot e = 0. \tag{17}$$

Notice that by Assumption A1:

$$\frac{d^2\overline{V}}{de^2} = k \cdot w \cdot \overline{a} \cdot f(h - e - \mu) - v < 0.$$

Hence, $\overline{V}$ is globally concave in e and the second order condition is satisfied.

By the implicit function theorem, the reaction of the endogenously determined e to h is:

$$\frac{de}{dh} = -\frac{\frac{d^2\overline{V}}{dedh}}{\frac{d^2\overline{V}}{de^2}} = \frac{k \cdot w \cdot \overline{a} \cdot f(h - e - \mu)}{k \cdot w \cdot \overline{a} \cdot f(h - e - \mu) - v} < 0. \tag{18}$$

■

Proof of Proposition 3

As before, we assume that $w \cdot \overline{a}$ is sufficiently small so that the owner seeks to induce the maximum amount of operational effort $\overline{a}$. The truth-telling constraints in (i) and the interim participation constraints in (ii) then require that the manager's informational rents take the form:

$$U(r) = k \cdot w \cdot \overline{a} \cdot \int_{-\infty}^{\infty} I(u)du.$$

The above equation shows that the manager earns non-negative informational rent for each r and each e. This implies that the manager's *ex ante* expected utility $E[U(r)|e] - v(e)$ is positive when $e = 0$; i.e., the manager can earn more than his reservation utility by exerting zero project development effort. Therefore, the manager's *ex ante* expected utility will always be positive when he chooses his project development effort optimally. Consequently, we can drop the *ex ante* participation constraint in (iii) as it is implied by the interim participation constraints in (ii).

Therefore, the owner's problem simplifies to the optimization program in $\mathbf{P}_3$. The remainder of the proof shows that there exists a unique solution (h^*,e^*) to $\mathbf{P}_3$. As shown in the proof of Proposition 2, for any given h, the manager's optimal choice of project development effort, $e(h)$, is uniquely given by the first-order condition in Equation 10. Let $\Pi(h,e(h))$ denote the owner's expected payoff as a function of the hurdle rate h. Differentiating with respect to h yields:

$$\frac{d\Pi}{dh}=\frac{\partial\Pi}{\partial h}+\frac{de}{dh}\frac{\partial\Pi}{\partial e},$$

where:

$$\frac{\partial\Pi}{\partial h}=-[h-H(h-e(h)-\mu)w\cdot\bar{a}]\cdot f(h-e(h)-\mu)\cdot k$$

and

$$\frac{\partial\Pi}{\partial e}=[h+H(h-e(h)-\mu)\cdot(1-w\cdot\bar{a})]\cdot f(h-e(h)-\mu)\cdot k.$$

Hence:

$$\begin{aligned}\frac{d\Pi}{dh}
&=\left\{-[h-H(h-e(h)-\mu)\cdot w\cdot\bar{a}]+\frac{de}{dh}[h+H(h-e(h)-\mu)(1-w\cdot\bar{a})]\right\}\\
&\quad\times f(h-e(h)-\mu)k\\
&=\left\{-\left(1-\frac{de}{dh}\right)h+\left[w\cdot\bar{a}+\frac{de}{dh}(1-w\cdot\bar{a})\right]H(h-e(h)-\mu)\right\}\\
&\quad\times f(h-e(h)-\mu)k\\
&=\left\{-\left(1-\frac{de}{dh}\right)f(h-e(h)-\mu)k\right\}\left\{h-\frac{w\cdot\bar{a}+\dfrac{de}{dh}(1-w\bar{a})}{\left(1-\dfrac{de}{dh}\right)}\cdot H(h-e(h)-\mu)\right\}\\
&=\underbrace{\left\{-\left(1-\frac{de}{dh}\right)f(h-e(h)-\mu)k\right\}}_{A}\underbrace{\left\{h-\left[w\cdot\bar{a}+\frac{\dfrac{de}{dh}}{1-\dfrac{de}{dh}}\right]\cdot H(h-e(h)-\mu)\right\}}_{B}.\end{aligned}$$

Since $\frac{de}{dh}<0$ from Proposition 2, $A<0$ for any h, so $\frac{d\Pi}{dh}$ and B are of opposite sign. Further, at the optimal h, $\frac{d\Pi}{dh}=B=0$:

$$h^* = \left[w \cdot \bar{a} + \frac{\dfrac{de(h^*)}{dh}}{\left(1 - \dfrac{de(h^*)}{dh}\right)} \right] H(h^* - e(h^*) - \mu).$$

Using the facts that $\dfrac{\frac{de}{dh}}{1 - \frac{de}{dh}} = -\dfrac{k \cdot w \cdot \bar{a}}{v} \cdot f(h - e(h) - \mu)$ and $e(h) = \dfrac{k \cdot w \cdot \bar{a}}{v} \cdot [1 - F(h - e(h) - \mu)]$, the optimal hurdle rate can be expressed as:

$$h^* = w \cdot \bar{a} \cdot H(h^* - e^* - \mu) - e^*, \tag{19}$$

where $e^* \equiv e(h^*)$ denotes the induced choice of project development effort at $h = h^*$, as defined by Equation (17).

Since $h^* < w \cdot \bar{a} \cdot H(h^* - e^* - \mu)$ and $H(\cdot)$ is a decreasing function, we have $h^* < h^0(e^*) \equiv w \cdot \bar{a} \cdot H(h^0 - e^* - \mu)$.

To show that the hurdle rate identified in Equation (19) is indeed a global maximum, we will show that the owner's expected payoff function $\Pi(h,e(h))$ is single-peaked in h. Differentiating B with respect to h yields:

$$\begin{aligned}
\operatorname{sgn}\left[\frac{dB}{dh}\right] &= \operatorname{sgn}\left[\frac{d\left(h - w \cdot \bar{a} \cdot H(\cdot) + \frac{k \cdot w \cdot \bar{a}}{v}(1 - F(\cdot))\right)}{dh}\right] \\
&= \operatorname{sgn}\left[1 - w \cdot \bar{a} \cdot H'(\cdot)\left(1 - \frac{de}{dh}\right) - \frac{k \cdot w \cdot \bar{a}}{v} f(\cdot)\left(1 - \frac{de}{dh}\right)\right] \\
&= \operatorname{sgn}\left[1 - w \cdot \bar{a} \cdot H'(\cdot)\left(1 - \frac{de}{dh}\right)\right. \\
&\qquad \left. - \frac{k \cdot w \cdot \bar{a}}{v} f(\cdot)\left(\frac{-v}{k \cdot w \cdot \bar{a} \cdot f(\cdot) - v}\right)\right] \\
&= \operatorname{sgn}\left[\frac{2 \cdot k \cdot w \cdot \bar{a} \cdot f(\cdot) - v}{k \cdot w \cdot \bar{a} \cdot f(\cdot) - v} - w \cdot \bar{a} \cdot H'(\cdot)\left(1 - \frac{de}{dh}\right)\right] > 0,
\end{aligned} \tag{20}$$

where the argument of $H(\cdot)$, $F(\cdot)$, and $f(\cdot)$ is $(h - e(h) - \mu)$ and has been suppressed for brevity. Given Assumption A1, it follows that $k \cdot w \cdot \bar{a} \cdot f(\cdot) < 2 \cdot k \cdot w \cdot \bar{a} \cdot f(\cdot) < v$. As a consequence, $\dfrac{2 \cdot k \cdot w \cdot \bar{a} \cdot f(\cdot) - v}{k \cdot w \cdot \bar{a} \cdot f(\cdot) - v} > 0$. Furthermore, since $\dfrac{de}{dh} < 0$ and $H'(\cdot) < 0$, it follows that $\dfrac{dB}{dh} > 0$. Given that $B = 0$ at h^* and $A < 0$ for any h, Π is increasing in h for $h < h^*$ and decreasing in h for $h > h^*$. Therefore, $\Pi(\cdot)$ is single-peaked and the solution identified in Equation (19) combined with $e^* \equiv e(h^*)$ constitutes the unique solution to the maximization problem in $\mathbf{P}_3$. ■

Proof of Proposition 4

By (17) and (19), the optimal values of h^* and e^* are given by the unique solution to the following system of nonlinear equations:

$$h^* = w \cdot \bar{a} \cdot H(h^* - e^* - \mu) - e^*$$

$$e^* = \frac{k \cdot w \cdot \bar{a}}{v} \cdot [1 - F(h^* - e^* - \mu)].$$

Let:

$$G^1 = h^* + e^* - H(h^* - e^* - \mu)w \cdot \bar{a} = 0, \tag{21}$$

$$G^2 = e^* - \frac{k}{v}(1 - F(h^* - e^* - \mu))w \cdot \bar{a} = 0. \tag{22}$$

Letting $\lambda = \frac{k}{v}$ and differentiating (21) and (22) with respect to λ yields:

$$\begin{bmatrix} G^1_{h^*} & G^1_{e^*} \\ G^2_{h^*} & G^2_{e^*} \end{bmatrix} \begin{bmatrix} \frac{\partial h^*}{\partial \lambda} \\ \frac{\partial e^*}{\partial \lambda} \end{bmatrix} = \begin{bmatrix} 0 \\ (1 - F(h^* - e^* - \mu))w \cdot \bar{a} \end{bmatrix},$$

where the matrix coefficients are functions of e^*, h^*, and the parameters of the model. It can be verified from (20) that $\begin{vmatrix} G^1_{h^*} & G^1_{e^*} \\ G^2_{h^*} & G^2_{e^*} \end{vmatrix} = G^1_{h^*}G^2_{e^*} - G^1_{e^*}G^2_{h^*} > 0$. Then a straightforward application of Cramer's rule reveals that:

$$\text{sgn}\left[\frac{\partial e^*}{\partial \lambda}\right] = \text{sgn}[(1 - F(h^* - e^* - \mu))w \cdot \bar{a}] > 0.$$

Now we prove the upper and lower bounds of e^* and its asymptotic properties with respect to h. First, it is easy to see from Equation (22) that $0 < e^* < \frac{k \cdot w \cdot \bar{a}}{v}$ since $0 < [1 - F(h^* - e^* - \mu)] < 1$. Let $e^1(\mu)$ be the e identified by the equation $e - \frac{k}{v}\left[1 - F\left(\frac{k \cdot w \cdot \bar{a}}{v} - e - \mu\right)\right] w \cdot \bar{a} = 0$, and let $e^*(\mu)$ be the optimal effort choice parameterized by μ. Notice that $h^* = w \cdot \bar{a} \cdot H(h^* - e^* - \mu) - e^* > \frac{k \cdot w \cdot \bar{a}}{v}$. Hence, $0 < e^*(\mu) < e^1(\mu)$ for all μ. Therefore, it follows that $\lim_{\mu \to -\infty} e^1(\mu) = 0$. Consequently, $0 \le \lim_{\mu \to -\infty} e^*(\mu) \le \lim_{\mu \to -\infty} e^1(\mu) = 0$. Thus we must have $\lim_{\mu \to -\infty} e^*(\mu) = 0$.

To show that $\lim_{\mu \to \infty} e^* = \frac{k \cdot w \cdot \bar{a}}{v}$, let $e^2(\mu)$ be the e identified by the equation:

$$e - \frac{k}{v}\left[1 - F\left(h^0\left(\frac{k \cdot w \cdot \bar{a}}{v}\right) - e - \mu\right)\right] w \cdot \bar{a} = 0.$$

Notice that for all μ:

$$
\begin{aligned}
h^* &= w \cdot \bar{a} \cdot H(h^* - e^* - \mu) - e^* \\
&< h^0(e^*) \\
&< h^0\left(\frac{k \cdot w \cdot \bar{a}}{v}\right),
\end{aligned}
$$

where the first inequality is from Proposition 2 and the second inequality is from Proposition 1 and the fact that $e^* < \frac{k \cdot w \cdot \bar{a}}{v}$. Hence, $e^2(\mu) < e^*(\mu) < \frac{k \cdot w \cdot \bar{a}}{v}$ for all μ. Since $\lim_{\mu \to \infty} \left(h^0\left(\frac{k \cdot w \cdot \bar{a}}{v}\right) - \mu\right) = -\infty$,[16] it is obvious that $\lim_{\mu \to \infty} e^2(\mu) = \frac{k \cdot w \cdot \bar{a}}{v}$. Consequently, $\frac{k \cdot w \cdot \bar{a}}{v} = \lim_{\mu \to \infty} e^2(\mu) \leq \lim_{\mu \to \infty} e^*(\mu) \leq \frac{k \cdot w \cdot \bar{a}}{v}$. Thus, we must have $\lim_{\mu \to \infty} e^*(\mu) = \frac{k \cdot w \cdot \bar{a}}{v}$.

■

Proof of Proposition 5

Using the change of variable $z^* = e^* + \mu$, we can rewrite Equations (21) and (22) as follows:

$$G^1 = h^* + z^* - \mu - w \cdot \bar{a} \cdot H(h^* - z^*) = 0 \tag{23}$$

$$G^2 = z^* - \mu - \frac{k \cdot w \cdot \bar{a}}{v}[1 - F(h^* - z^*)] = 0. \tag{24}$$

Differentiating with respect to μ yields:

$$\begin{bmatrix} G^1_{h^*} & G^1_{z^*} \\ G^2_{h^*} & G^2_{z^*} \end{bmatrix} \begin{bmatrix} \dfrac{\partial h^*}{\partial \mu} \\ \dfrac{\partial z^*}{\partial \mu} \end{bmatrix} + \begin{bmatrix} G^1_{\mu} \\ G^2_{\mu} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix},$$

---

[16] To see this, notice that $\dfrac{d\left(h^0\left(\frac{k \cdot w \cdot \bar{a}}{v}\right) - \mu\right)}{d\mu} = -\dfrac{1}{1 - w \cdot \bar{a} \cdot H'\left(h^0\left(\frac{k \cdot w \cdot \bar{a}}{v}\right) - e - \mu\right)} < 0$. Further, by the definition of h^0, we have $h^0\left(\frac{k \cdot w \cdot \bar{a}}{v}\right) - \mu = H\left(h^0\left(\frac{k \cdot w \cdot \bar{a}}{v}\right) - \frac{k \cdot w \cdot \bar{a}}{v} - \mu\right) - \mu$. To have the above equality hold as μ goes to ∞, we must have $\lim_{\mu \to \infty} h^0\left(\frac{k \cdot w \cdot \bar{a}}{v}\right) - \mu = -\infty$.

where:

$$
\begin{aligned}
G^1_{h^*} &= 1 - w \cdot \bar{a} \cdot H'(h^* - z^*),\\
G^1_{z^*} &= 1 + w \cdot \bar{a} \cdot H'(h^* - z^*),\\
G^1_{\mu} &= -1,\\
G^2_{h^*} &= \frac{k \cdot w \cdot \bar{a}}{v} f(h^* - z^*),\\
G^2_{z^*} &= 1 - \frac{k \cdot w \cdot \bar{a}}{v} f(h^* - z^*),\\
G^2_{\mu} &= -1.
\end{aligned}
$$

By Cramer's rule:

$$\frac{\partial h^*}{\partial \mu} = \frac{G^1_{z^*}G^2_{\mu} - G^2_{z^*}G^1_{\mu}}{G^1_{h^*}G^2_{z^*} - G^2_{h^*}G^1_{z^*}}$$

$$\frac{\partial z^*}{\partial \mu} = \frac{G^2_{h^*}G^1_{\mu} - G^1_{h^*}G^2_{\mu}}{G^1_{h^*}G^2_{z^*} - G^2_{h^*}G^1_{z^*}}.$$

Under (A1), the optimal $\{h^*,z^*\}$ is the unique solution that solves (23) and (24) for each μ. Further, since G^1 and G^2 are continuously differentiable, h^* and z^* must be continuous functions of μ.

To prove the proposition, we follow the three steps below:

Step 1. We show that z^* is monotonically increasing in μ. It can be easily verified that $G^1_{h^*}G^2_{z^*} - G^2_{h^*}G^1_{z^*} > 0$ from the second order condition of $\mathbf{P}_2$. Therefore:

$$
\begin{aligned}
\operatorname{sgn}\left[\frac{\partial z^*}{\partial \mu}\right] &= \operatorname{sgn}[G^2_{h^*}G^1_{\mu} - G^1_{h^*}G^2_{\mu}]\\
&= -\operatorname{sgn}[G^2_{h^*} - G^1_{h^*}]\\
&= -\operatorname{sgn}\left[\frac{k \cdot w \cdot \bar{a}}{v} f(h^* - z^*) - 1 + w \cdot \bar{a} \cdot H'(h^* - z^*)\right]\\
&> 0,
\end{aligned}
$$

because $\frac{k \cdot w \cdot \bar{a}}{v} f(h^* - z^*) - 1 < 0$ by Assumption (A1) and $H'(h^* - z^*) < 0$.

Step 2. Now we study the sign of z^* at $h^* = 0$. At $h^* = 0$, to satisfy $G^1 = G^2 = 0$, we must have:

$$f(z^*) = \frac{v}{k}. \tag{25}$$

For unimodal and symmetric distribution function $f(\cdot)$, the above equation has solutions only when $\frac{v}{k} < \max f(\cdot)$.[17] Let z_1^* and z_2^* denote the solutions to Equation (25), then:

$$z_1^* < 0 < z_2^* \text{ and } |z_1^*| = |z_2^*|.$$

The corresponding μ_1 and μ_2 are calculated as follows:

$$\mu_1 = z_1^* - \frac{k \cdot w \cdot \bar{a}}{v} \cdot F(z_1^*)$$

and:

$$\mu_2 = z_2^* - \frac{k \cdot w \cdot \bar{a}}{v} \cdot F(z_2^*).$$

Step 3. Last, we study the sign of $\frac{\partial h^*}{\partial \mu}$ at $h^* = 0$. Note that:

$$\begin{aligned}
\operatorname{sgn}\left[\frac{\partial h^*}{\partial \mu}\right] &= \operatorname{sgn}[G^1_{z^*}G^2_{\mu} - G^2_{z^*}G^1_{\mu}] \\
&= -\operatorname{sgn}[G^1_{z^*} - G^2_{z^*}] \\
&= -\operatorname{sgn}\left[1 + w \cdot \bar{a} \cdot H'(h^* - z^*) - \left(1 - \frac{k \cdot w \cdot \bar{a}}{v} \cdot f(h^* - z^*)\right)\right] \\
&= -\operatorname{sgn}\left[w \cdot \bar{a} \cdot H'(h^* - z^*) + \frac{k \cdot w \cdot \bar{a}}{v} \cdot f(h^* - z^*)\right] \\
&= -\operatorname{sgn}\left[-1 + H(h^* - z^*)\frac{-f'(h^* - z^*)}{f(h^* - z^*)} + \frac{k}{v} \cdot f(h^* - z^*)\right].
\end{aligned}$$

When $h^* = 0$, Equation (25) implies that $\frac{k}{v} \cdot f(h^* - z^*) = 1$. Therefore, it follows that:

$$\operatorname{sgn}\left[\frac{\partial h^*}{\partial \mu}\right]\Bigg|_{h^*=0} = \operatorname{sgn}[f'(-z^*)]|_{h^*=0}.$$

Since $f(x)$ is monotonically increasing for $x < 0$ and monotonically decreasing for $x > 0$, it must be the case that $f'(-z_1^*) < 0$ and $f'(-z_2^*) > 0$. Given that h^* and z^* are continuous functions of μ and that z^* is increasing in μ, h^* must cross zero twice, first from positive to negative and then from negative to positive. Hence, h^* is positive for small μ, crosses zero at μ_1, becomes negative in the interval of (μ_1,μ_2), crosses zero again at μ_2, and remains positive for all $\mu > \mu_2$. This property implies that when $\frac{v}{k}$ is small enough, $h^*(\mu)$ achieves its minimum when μ is neither too large nor too small. ■

---

[17] Assumption A1 requires that $\max f(\cdot) < \frac{v}{k} \cdot \frac{1}{2 \cdot w \cdot \bar{a}}$. Therefore, as long as $2 \cdot w \cdot \bar{a} < 1$, there always exists $\frac{v}{k}$ that satisfies Assumption A1 and the above condition that $\frac{v}{k} < \max f(\cdot)$.

Proof of Proposition 6

The owner chooses the compensation parameters such that $\beta = w \cdot \bar{a}$ and $\alpha = w(\bar{a}) - w \cdot \bar{a}$. The choice of bonus coefficient ensures that the manager will choose $a = \bar{a}$. Since the capital charge rate is equal to h^*, Equation (14) shows that the manager will invest if and only if $r \geq h^*$. The choice of the fixed salary α ensures that the manager's compensation is equal to $w(\bar{a}) + \max\{0, k \cdot w \cdot \bar{a} \cdot (r - h^*) \cdot I(r)\}$. As a consequence, for each value of r, this delegated scheme generates the same information rent for the manager as the optimal revelation mechanism. This implies that the manager's participation constraints are satisfied and the owner's expected payoffs are the same as under the optimal revelation scheme. ■

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The Impact of Shareholder Activism on Financial Reporting and Compensation: The Case of Employee Stock Options Expensing

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ABSTRACT: We examine the economic consequences of more than 150 shareholder proposals to expense employee stock options (ESO) submitted during the proxy seasons of 2003 and 2004, the first case in which the SEC allowed a shareholder vote on an accounting matter. Our results indicate that these proposals affected accounting and compensation choices. Specifically, (1) targeted firms were more likely to adopt ESO expensing relative to a control sample of S&P 500 firms, (2) among targeted firms, the likelihood of adoption increased in the degree of voting support for the proposal, and (3) non-targeted firms were more likely to adopt ESO expensing when a peer firm was targeted. Additionally, (1) CEO pay decreased in firms in which the proposal was approved relative to a control sample of S&P 500 firms, and (2) among targeted firms, approval of the proposal was associated with decreases in CEO compensation and the use of ESO in CEO pay. Our findings reveal an increasing influence of shareholder proposals on governance practices.

Keywords: *shareholder activism; corporate governance; financial reporting; executive compensation; stock option expensing.*

Data Availability: *All data are publicly available from sources identified in the text.*

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I. INTRODUCTION

In 2002, following a number of high-profile accounting scandals, regulators, legislators, capital market intermediaries, investors, and firms began to reconsider the accounting treatment of employee stock options (ESO). The scandals were partly attributed to an accounting rule that essentially allowed firms to report no compensation expense for ESO.[1] In particular, it was argued that the favorable reporting treatment had led to an excessive use of option-based compensation (e.g., Bodie et al. 2003; Hall and Murphy 2003) that "perversely created incentives to artificially inflate reported earnings in order to keep stock prices high and rising" (Greenspan 2002). Indeed, subsequent studies suggested a systematic link between the use of stock options and degree of earnings management and likelihood of accounting restatements (Bergstresser and Philippon 2006; Burns and Kedia 2006; Efendi et al. 2007). Critics also pointed to other questionable practices induced by extensive use of option-based pay such as the opportunistic timing of grant dates and opportunistic release of financial information around option grants and exercises (Aboody and Kasznik 2000; Bartov and Mohanram 2004; Ferri 2005; Yermack 1997). The ensuing debate led eventually to the Financial Accounting Standards Board (FASB) releasing in December 2004 a revised rule, SFAS No. 123R, that required all firms to expense ESO based on fair value at grant date.

As the debate escalated in the latter part of 2002, a group of shareholders (predominantly union pension funds) targeted a number of firms with a proposal requesting an advisory shareholder vote on whether ESO should be expensed.[2] More than 150 shareholder proposals on this matter were submitted during the 2003 and 2004 proxy seasons. To shed light on the broader question of whether shareholder votes influence management decisions and governance practices, despite their advisory nature, we assess the economic consequences of the ESO expensing proposals by analyzing their impact on (1) the rate of voluntary adoption of ESO expensing prior to the release of SFAS No. 123R, and (2) the level and composition of CEO pay.

We find that firms targeted by ESO expensing proposals were more likely to subsequently adopt ESO expensing relative to a control sample of S&P 500 firms. In particular, the presence of a proposal is associated with a 10.65 percent increase (from 5.99 percent to 16.64 percent) in the probability of adopting ESO expensing. The result is robust to a correction for endogeneity to address the concern that firms were targeted for reasons related to the likelihood of adoption. Also, the likelihood of adoption among targeted firms increases in the degree of voting support for the proposal. Finally, we find that non-targeted firms were more likely to adopt ESO expensing when a peer firm (i.e., a firm in the same four-digit SIC industry code) was targeted by an ESO expensing shareholder proposal.

With respect to compensation practices, we find that targeted firms subsequently experienced a decrease in the *level* of CEO compensation relative to a control sample of S&P 500 firms. Further analysis shows this finding to be entirely driven by the subset of targeted firms in which the proposal was approved. In particular, the approval of an ESO expensing proposal is associated with a subsequent decrease of approximately \$2.29 million in CEO compensation (versus an increase of \$0.34 million in non-targeted firms). Also, among targeted firms receiving a vote, there is a negative relation between approval of the proposal and the subsequent change in CEO compensation. As for the *composition* of CEO compensation, the percentage of total pay represented by ESO does not change for targeted firms relative to non-targeted firms. However, approval of the proposal and the change in the percentage of total pay represented by ESO are negatively related in targeted firms receiving a vote. In particular, the relative weight of ESO in CEO pay increased by 3.2 percentage points in firms in which the proposal was not approved, and decreased by 7.8 percentage points in firms in which it was approved. The results are robust to eliminating the effects of firms being targeted in both 2003 and 2004, and to other potential drivers of compensation changes such as the contemporaneous adoption of ESO expensing.

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[1] At that time, the Statement of Financial Accounting Standards (SFAS) No. 123 (issued in 1995) allowed a company to account for ESO using either the *fair value method* or the *intrinsic value method* (prescribed since 1972 by Accounting Principles Board Opinion No. 25). All companies electing the intrinsic value method were required to make pro forma disclosures of net income as if the fair-value-based method had been applied. Under the fair value method, compensation cost is measured through an option-pricing model at the grant date, whereas under the intrinsic value method compensation cost is calculated as the difference between the firm's stock price and the exercise price on the grant date. Since the exercise price is typically set equal to the stock price on the grant date, the intrinsic value method essentially results in no compensation cost for ESO being recognized in the income statement. Until 2002, virtually all firms opted for the intrinsic value method.

[2] Hereafter, for simplicity, we will refer to the adoption of the fair value method of ESO accounting as adoption of "ESO expensing," and the related proposals will be termed "ESO expensing proposals."

Overall, our evidence of significant effects on CEO compensation and voluntary adoption of a key accounting method suggests a growing influence of shareholder proposals and shareholder votes on governance practices.

Our study contributes to the accounting literature that relates shareholder behavior to accounting choices. Previous research that examined the association between shareholders' composition and reporting choices generally concluded that investors exhibit a preference for particular accounting methods, in that they tend to invest in firms with certain reporting characteristics (Bradshaw et al. 2004; Bushee 2001). However, there is little or no evidence that investors take observable actions to affect those choices.[3] We contribute to this literature by providing compelling evidence of a direct mechanism (shareholder proposals) through which shareholders not only expressed their preference for a voluntary accounting choice (the adoption of ESO expensing), but also successfully pressured management to adopt the preferred accounting method, with spillover effects on non-targeted firms.

Our research also contributes to the literature on executive compensation. Previous studies find no evidence that compensation-related shareholder proposals during the mid-1990s influenced the level or composition of CEO compensation (Johnson and Shackell 1997; Thomas and Martin 1999). In contrast, we find that ESO expensing proposals were associated with subsequent changes in the level and composition of CEO pay in targeted firms in which the proposal received higher voting support. This evidence is of particular importance to policy-makers debating the introduction of a mandatory advisory annual shareholder vote (known as the "say on pay" vote) on the executive compensation report included in the proxy statement.[4]

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[3] Bradshaw et al. (2004) find a relation between accounting choices and U.S. institutional investor ownership in a sample of non-U.S. firms, with U.S. investors exhibiting a preference for accounting methods that conform to U.S. GAAP. However, although increases in U.S. GAAP conformity precede increases in U.S. institutional holdings, increases in ownership by U.S. institutional investors are not followed by an increase in U.S. GAAP conformity. This evidence suggests that accounting choices and methods are one component of investors' preferences set, but investors do not affect the accounting choices of the firms they invest in. Park and Shin (2004) find some evidence that the presence of active institutional shareholders on the board of directors is associated with a reduction in the use of income-increasing accrual manipulations to meet earnings targets, but draw no causality inferences.

[4] A bill seeking to mandate a "say on pay" vote was approved by the House of Representatives in April 2007. Shortly thereafter, an analogous bill was introduced in the Senate by then presidential candidate Barack Obama. Besides, between 2006 and 2008, shareholder activists led by AFSCME (a union pension fund) targeted more than 150 U.S. firms with non-binding shareholder proposals requesting the adoption of "say on pay" (Ferri and Maber 2008).

Finally, we contribute to a growing line of research on shareholder activism. In particular, our findings complement recent evidence that suggests greater influence of shareholder proposals and votes on corporate decisions in the post-SOX environment (e.g., Del Guercio et al. 2008; Ertimur, Ferri, and Stubben 2008; Guo et al. 2008; Thomas and Cotter 2007). This evidence is of great relevance as the Securities and Exchange Commission (SEC) is currently re-examining the proxy voting process (SEC 2007), and some critics have suggested eliminating advisory resolutions from the proxies due to their limited effects (Baue 2007). Also, previous studies focused mostly on the impact on targeted firms; our study is the first to respond to Karpoff's (2001) call to examine the existence of spillover effects on non-targeted firms.

The remainder of the paper is organized as follows. In Section II, we describe the institutional background of shareholder proposals. In Section III we develop predictions on the economic consequences of ESO expensing shareholder proposals. In Section IV, we describe the sample, discuss the motives of the proponents, and examine characteristics of the targeted firms. In Sections V and VI, we outline our methodology and define the variables used in the tests, and analyze the effects of the proposals on firm behavior with regard to the adoption of ESO expensing and compensation choices. Section VII concludes.

II. INSTITUTIONAL BACKGROUND: SHAREHOLDER PROPOSALS UNDER RULE 14a-8

Under Rule 14a-8 of the Securities Exchange Act of 1934, any shareholder continuously holding shares worth at least \$2,000 (or 1 percent of the market value of equity) for one year or more is allowed to include one (and only one) proposal with a 500-word supporting statement in the proxy statement distributed by a company for its annual shareholder meeting. These proposals request a vote in favor or against a particular issue (e.g., the expensing of ESO) from all shareholders and must be submitted to the company at least 120 days before the proxy statement is mailed to shareholders prior to the annual meeting. The board of directors might persuade the proponent to withdraw the proposal (and thus avoid a shareholder vote) either by agreeing to it or by agreeing to other concessions. Alternatively, the board might request the SEC to exclude a proposal that violates certain conditions.[5] The SEC then issues a no-action letter that determines whether the proposal is to be included (sometimes in a revised format). Proposals neither withdrawn nor excluded will be included in the proxy statement and voted upon at the annual meeting by all shareholders of record as of a given date indicated in the proxy materials.

Among the reasons for shareholder proposal exclusion, two are of particular relevance to our study. First, proposals might be excluded if considered improper under the company's state laws. Proposals binding on a company are generally regarded as improper, reflecting states' aversion to limit a board's ability to exercise business judgment and its fiduciary role. As a result, almost all proposals to the board are written as non-binding recommendations (Black 1990). Second, proposals might be excluded if they deal with a matter related to the company's "ordinary business." Over time, the SEC has taken a more liberal stance on the interpretation of this provision. For example, since 1992 the SEC has allowed proposals on executive pay, originally excluded as deemed to be dealing with "ordinary business" (Johnson and Shackell 1997).

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[5] Under Rule 14a-8(i), firms may request the exclusion of proposals that address ordinary business matters, proposals related to an election for membership on the company's board of directors, and proposals that request specific amounts of cash and stock dividends, among other reasons. A proposal may also be excluded if it conflicts with one of the management proposals to be submitted to shareholders at the same meeting, or if it had been already submitted in the past and had received less than a certain percentage of votes in favor (3 percent if presented once, 6 percent if presented twice, 10 percent if presented three times). See http://www.sec.gov/interps/legal/cfslb14.htm.

Accounting matters were not the subject of shareholder proposals until the summer of 2002, when shareholders targeted a number of firms with a non-binding proposal to expense ESO (see Section IV). In July 2002, one of the targeted firms, National Semiconductor, requested that the SEC omit the proposal on the basis that the choice of accounting methods represented an "ordinary business" matter. The SEC staff concurred with this view. This decision raised criticism among observers, however, and in December 2002 the SEC reversed its position on the grounds that the accounting treatment of ESO had become a "social policy" issue. As a result, more than 150 shareholder proposals to expense ESO were submitted during the 2003 and 2004 proxy seasons. These proposals constitute the sample we analyze.

III. EMPIRICAL PREDICTIONS

Effect of Shareholder Proposals on the Adoption of ESO Expensing

In considering the consequences of the 2003–2004 ESO expensing proposals, the most immediate question is whether these proposals were eventually adopted by targeted firms—that is, whether targeted firms decided to expense ESO. The empirical evidence from the 1980s and 1990s generally indicates a weak impact of shareholder proposals on the governance practices of targeted firms (Black 1998; Gillan and Starks 1998, 2007; Karpoff 2001; Romano 2001). In part, the limited effects reflected the fact that most proposals, usually submitted by individual investors, garnered little voting support (e.g., Del Guercio and Hawkins 1999; Gillan and Starks 2000; Gordon and Pound 1993; Wahal 1996).

However, three considerations lead us to predict greater effectiveness in the case of ESO expensing proposals. First, starting in the summer of 2002, the accounting treatment for ESO received greater media coverage than the issues underlying most other shareholder proposals, in part, because of the alleged role of ESO in the recent wave of accounting scandals. Hence, targeted firms' actions in response to ESO expensing proposals were likely to be subject to particularly close scrutiny (e.g., La Monica 2004; Lavelle 2003). Second, as detailed in Appendix A, broad support for ESO expensing built quickly, fueled by the voluntary adoption by high-profile firms and public statements by influential corporate governance advocates and business leaders such as Warren Buffett (*New York Times* 2002) and Alan Greenspan (*Globe and Mail* 2002). Those statements were often cited by shareholders submitting ESO expensing proposals (see Appendix B).[6] As a result, the managerial reputation cost associated with opposing these proposals was potentially quite high. Finally, unlike most shareholder proposals, ESO expensing proposals received significant voting support, nearly half garnering a majority vote (see Section IV). After the Enron-type scandals and passage of Sarbanes-Oxley, the cost of ignoring shareholder proposals supported by a majority vote increased significantly as shareholder activists, governance rating agencies, proxy voting services, and the press began to single out unresponsive firms.[7] Besides, a high degree of voting support tends to galvanize proponents and result in more intense follow-up pressure.[8] High voting support might also persuade the board that the proposal is in the best interest of the company. Consistent with these arguments, Ertimur, Ferri, and Stubben (2008) found that the frequency of implementation of majority-vote proposals nearly doubled after 2002 (exceeding 40 percent in 2003–2004), that the likelihood of implementation increases with the degree of voting support, and that unresponsive board members are penalized in the director labor market.

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[6] Aboody et al. (2004) report that Warren Buffett was a member of the board (or Berkshire Hathaway an investor in) 12 of the 155 firms (analyzed in their study) that voluntarily adopted ESO expensing in 2002.

[7] In recent years, directors failing to implement majority-vote proposals have become the target of "vote-no" campaigns, with negative effects on their reputation in their labor market (Del Guercio et al. 2008). One of the most influential proxy voting services (Institutional Shareholder Services 2006) recommends that shareholders withhold votes from directors failing to adopt a proposal supported by a majority of votes. Firms ignoring majority vote proposals are singled out in CalPERS Focus List (CalPERS 2007), receive lower ratings from governance services, such as The Corporate Library, and attract negative press coverage (CFO.com 2003).

In light of the foregoing arguments, we make the following predictions regarding the impact of ESO expensing proposals on targeted firms.

Prediction 1: We predict a higher likelihood of voluntary expensing of ESO in:

a. firms targeted by an ESO expensing shareholder proposal,
b. targeted firms in which the proposal receives higher voting support.

In addition to precipitating change in the targeted firms, shareholder proposals might have spillover effects on the actions of other firms, a possibility recognized but not examined in previous research.[9] Our setting is well suited to examine this question, as the incentives to promote spillover effects are particularly strong for union pension funds, which mostly operate as indexed funds (Del Guercio and Hawkins 1999; Kahan and Rock 2007). We conjecture that the presence of an ESO expensing shareholder proposal at a targeted firm might lead peer firms' boards to adopt ESO expensing in order to avoid a similar proposal. Firms might have perceived "voluntary" adoption of ESO expensing to be a less costly outcome for two reasons. First, firms might be motivated "to proactively improve their corporate governance structures without being explicitly targeted" (Del Guercio and Hawkins 1999) to avoid publicity. In our setting, the high visibility of the proposals was likely to increase scrutiny of firms' executive pay practices.[10] For example, shareholder proponents' supporting statements suggested that lack of ESO expensing had resulted in excessive use of ESO for compensation (see Appendix B for specific examples).

Second, in the event of a majority vote (a real possibility given the broad support for ESO expensing among institutional investors), the firm would have had to choose between adopting ESO expensing anyway and ignoring the shareholders' vote, with negative consequences for firms' and directors' reputations (discussed earlier in footnote 7). These arguments lead us to advance the following prediction.

Prediction 1: We predict a higher likelihood of voluntary expensing of ESO in:

c. non-targeted firms in industries in which at least one other firm is targeted by an ESO expensing shareholder proposal.

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[8] For example, after the 2007 proxy season, the Council for Institutional Investors, a nonprofit association of pension funds with combined assets exceeding $3 trillion, sent a series of letters to all firms in which shareholder proposals received a majority vote urging implementation (RiskMetrics 2008).

[9] Del Guercio and Hawkins (1999) report some indirect anecdotal evidence of spillover effects (e.g., interviews with top CalPERS officials stating that non-targeted firms pay attention to CalPERS' interactions with target firms). In his review paper, Karpoff (2001) notes the lack of empirical analysis of spillover effects and asks: "Are non-target companies affected, for example, when other firms in the same industry ... attract activist efforts?"

[10] Previous research suggests that managers try to avoid scrutiny of their compensation packages. Firms paying larger amounts of compensation to their executives are more likely to (1) lobby against more explicit forms of disclosure of executive pay (Dechow et al. 1996; Hill et al. 2002), (2) disavow (Blacconiere et al. 2004) and manage downward the option expense disclosed (Aboody et al. 2006) or recognized (Johnston 2006) under SFAS No. 123, and (3) have poorer voluntary disclosure of compensation practices in the proxy statements (Laksmana 2008).

Effect of Shareholder Proposals on CEO Compensation

Our second set of predictions concerns the effect of ESO expensing proposals on CEO compensation practices. Although technically focused on an accounting issue, ESO expensing proposals encouraged scrutiny of executive pay, as proponents' statements and many observers explicitly traced excessive use of options to the accounting treatment (see the "Introduction" section and Appendix B).[11] Previous research that examined the effects of compensation-related shareholder proposals in the 1990s found that such proposals received low voting support (votes in favor averaging less than 15 percent) and had virtually no effect on the level and composition of CEO compensation.[12] There are two reasons to expect a stronger impact in the case of ESO expensing proposals. First, in the aftermath of the accounting scandals and collapse of the technology sector (which relied heavily on the use of ESO) in 2001 and 2002, investor sentiment regarding executive compensation and ESO, in particular, had become increasingly negative (Bartov and Hayn 2006), paving the way for an unprecedented degree of investor scrutiny of executive compensation.[13] It is conceivable that targeted firms' boards and management decided to take action with respect to CEO pay (regardless of their decision to adopt ESO expensing) to prevent more detrimental outcomes (e.g., vote-no campaigns against the board or regulatory intervention) and reduce the degree of scrutiny. Specific actions might have included downward pressure on pay levels and a shift away from stock options toward other forms of compensation.

Second, unlike the compensation proposals presented in the 1990s, ESO expensing proposals received significant voting support.[14] As we argued leading up to Prediction 1b, we expect stronger effects in firms in which voting support for the proposals was higher.

Prediction 2: We predict a lesser increase (or greater decrease) in CEO total compensation and use of stock options in CEO compensation in:

a. firms targeted by an ESO expensing shareholder proposal,
b. targeted firms in which the proposal receives higher voting support.

An alternative view is that shareholder proposals are ineffective because they are nonbinding and can be ignored at essentially no cost to management (Karpoff et al. 1996; Wahal 1996), in which case Predictions 1 and 2 would not be supported by the data.

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[11] Ferri et al. (2008) find that voting support for ESO expensing was higher in firms with higher use of ESO (relative to their peers), consistent with investors expecting that either the adoption of ESO expensing or the visibility of the proposal would lead firms to revise their compensation practices, and, in particular, reduce the use of ESO.

[12] Johnson and Shackell (1997) analyze 169 compensation-related proposals submitted between 1992 and 1995. Most of these proposals were sponsored by individual shareholders and called for lower CEO pay, increased compensation disclosure, and independence of the compensation committee. Average voting support was 13 percent, with none of the proposals receiving a majority vote and no significant effect on subsequent compensation levels. Thomas and Martin (1999) analyze 168 compensation-related proposals over the 1993–1997 period and find no significant changes in the level or composition of CEO compensation.

[13] The number of compensation-related proposals submitted at S&P 1500 firms jumped from 320 between 1998 and 2002 to 720 between 2003 and 2007 (Ertimur, Ferri, and Muslu 2008). At the same time, activists resorted to highly publicized vote-no campaigns against compensation committee members (e.g., at Home Depot and Pfizer). The press and governance rating agencies (e.g., The Corporate Library) also contributed to keeping CEO pay in the headlines.

[14] A third argument is that ESO expensing proposals had greater impact than prior compensation-related proposals because they benefited from intense media coverage. However, previous studies document a modest impact of negative press coverage on CEO compensation (Johnson et al. 1997; Core et al. 2008).

IV. SAMPLE SELECTION AND ESO EXPENSING SHAREHOLDER PROPOSALS

Primary Sample

Our primary sample consists of all ESO expensing shareholder proposals submitted during the 2003 and 2004 proxy seasons, which correspond to the period from the SEC's decision to allow ESO expensing shareholder proposals (December 2002) to the FASB's release of SFAS No. 123R mandating the fair value method of accounting for ESO (December 2004). To identify these proposals, we perform a keyword search of the proxy statements of all SEC registered firms using a search string of the words "Proposal" and "Expensing" within a distance of six words. We then verify this list *vis-à-vis* other online references (The Corporate Library, Georgeson Shareholder). We complement this search with a list of proposals submitted and withdrawn (and thus not included in the proxy statements) provided by the United Brotherhood of Carpenters and Joiners of America (UBCJA). Including withdrawn proposals (often not available to researchers) is crucial to capture the full impact of shareholder proposals on firms' behavior, one reason for withdrawal being that the firm took action to address the proponents' requests (e.g., Del Guercio and Hawkins 1999; Strickland et al. 1996). Our search yielded 153 shareholder proposals (in 131 firms), 107 of which were voted upon at the annual meeting (Table 1, Panel A).

Control Sample

Given that 95 percent of the targeted firms are either in the S&P 500 index or larger in size than the smallest firm in the S&P 500, our control sample consists of non-targeted firms in the S&P 500, excluding those already expensing ESO as of December 2002. The resulting control sample consists of 320 firms (Table 1, Panel B).

Data Sources

We hand-collected information about the ESO expensing proposals as well as any other compensation-related proposals (voting outcome, voting turnout, identity of proponents, date of annual meeting, and so forth) from the proxy statement prior to, and the 10-Q report following, the annual meeting. We obtained additional data from seven other sources: CRSP (stock price returns and volatility), Compustat (financial data and industry classification), ExecuComp (CEO and directors' pay), Thompson Financial (institutional ownership), Securities Data Corporation (acquisitions and equity issuance), 10-Ks and the Bureau of Labor Statistics (percentage of unionized employees at firm and industry level, respectively), and the December 16, 2004 Equity Research Report by Bear Stearns (list of firms voluntarily expensing ESO).

Below, we summarize the outcomes of the proposals, discuss proponents' motivations, and describe the characteristics of targeted firms.

Shareholder Proposals and Voting Outcome

As shown in Table 2, Panel A, votes in favor ("Votes For") ESO expensing proposals averaged 47 percent of all votes cast, resulting in 47.7 percent of the proposals (51 out of 107) being approved, one of the highest approval rates for a shareholder proposal (Ertimur, Ferri, and Stubben 2008). Other compensation-related shareholder proposals

TABLE 1
Sample Selection

Panel A: Primary Sample—Shareholder Proposals (Proxy Seasons 2003–2004)

	Number of Proposals	Number of Firms
Number of shareholder proposals on Option Expensing submitted[a]	153	131
Less—Proposals withdrawn ...		
... due to violation of technical requirements and others	19	19
... because the firm already had a policy of expensing ESO	3	3
Valid shareholder proposals on Option Expensing submitted	131	109
Less—Proposals withdrawn ...		
... because the firm agreed to expense options[b]	24	24
Shareholder proposals voted upon at the annual meeting	107	85

Panel B: Control Sample—S&P 500 Firms

	Number of Firms
S&P 500 Firms as of December 2002, with data available in CRSP, Compustat, and ExecuComp	477
Less—Targeted firms included in the S&P 500	97
Non-targeted S&P 500 firms	380
Less—Firms voluntarily expensing ESO[b]	60
Control Sample	320

[a] Firms are identified through a keyword search in the proxy statements of all firms registered at the SEC including the words "Proposal" and "Expensing" within a distance of six words. This search is complemented with a list of proposals submitted and then withdrawn (and, thus, never included in the proxy statements) provided by the United Brotherhood of Carpenters and Joiners of America (UBCJA) and from other online sources (http://www.thecorporatelibrary.com and http://www.georgesonshareholder.com).

[2] Firms are identified based on a list compiled by Bear Stearns & Co (Equity Research Report, December 16, 2004).

submitted to the same firms during the same period averaged about 20 percent Votes For.[15] Even more tellingly, Votes For as a percent of votes cast by shareholders other than insiders

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[15] Fifty-four of the 153 targeted firms received one (44 firms) or more (10 firms) other compensation-related proposals at the same annual meeting, resulting in 72 compensation-related proposals (excluding ESO expensing proposals). These proposals included: adoption of performance-based options plans such as indexed options or options with performance-based vesting conditions (38 cases); requirement for shareholder approval of large golden parachutes (7); replacement of options with performance-based restricted stock (5); exclusion of pension income from net income in determining executive bonuses (4); prohibition of issuance of stock option grants (2); requirement that executives retain a certain percentage of equity awards (3); mandating of a cap on executive pay (2); requirement for shareholder approval of certain supplemental executive retirement benefits (2); and others (9).

The average (median) percentage of votes cast in favor of these proposals was 24.4 percent (16.4 percent). Only eight of these 72 proposals received a majority vote (five proposals requiring shareholder approval of large golden parachutes, one proposal requiring shareholder approval of certain supplemental executive retirement benefits, one proposal requiring shareholder approval of all equity compensation plans, one proposal requiring exclusion of pension income from net income in determining executive bonuses).

TABLE 2
Voting Outcome of ESO Expensing Proposals

Panel A: Shareholder Proposals and Voting Outcome—Summary Data

	Average across All Proposals Voted In		
	2003	**2004**	**2003–2004**
Number of Proposals	72	35	107
Voting Turnout (= votes cast as a % of votes eligible)	72.7%	72.0%	72.5%
Percentage of Proposals Approved[a]	41.7%	60.0%	47.7%
Voting outcome (% of all votes cast)			
Votes For	45.0%	50.9%	47.0%
Votes Against	51.6%	45.6%	49.6%
Abstentions	3.4%	3.5%	3.4%
	100%	100%	100%
Voting outcome (% of all votes cast excluding abstentions)			
Votes For	46.6%	52.6%	48.6%
Votes Against	53.4%	47.4%	51.4%
	100%	100%	100%
Voting outcome (% of all votes cast excluding abstentions and insider votes)[b]			
Votes For	55.0%	60.8%	56.9%
Votes Against	45.0%	39.2%	43.1%
	100%	100%	100%
Percentage of proposals voted, proposed by:			
Union pension funds[c]	90.3%	88.6%	89.7%
Individuals	9.7%	11.4%	10.3%
	100%	100%	100%

Panel B: Voting Outcome for Firms with Shareholder Votes in 2003 and 2004

	Votes For as a Percentage of Votes Cast			Proposal Approval (1 = Yes) (according to firm's approval rule)		
	2003	**2004**	**Change**	**2003**	**2004**	**Change**
Allegheny Energy Inc.	39.7%	46.4%	6.6%	0	0	0
Allied Waste Industries Inc.	41.1%	38.9%	−2.2%	0	0	0
American Finl Group Inc.	20.6%	24.2%	3.6%	0	0	0
Cintas Corp.	32.4%	34.5%	2.0%	0	0	0
Citrix Systems Inc.	53.5%	68.8%	15.3%	1	1	0
Firstenergy	44.7%	53.2%	8.5%	0	1	1
Gillette Co.	40.7%	41.1%	0.4%	0	0	0
Hewlett-Packard Co.	43.4%	55.2%	11.8%	0	1	1
Intel Corp.	47.6%	54.5%	6.9%	0	1	1
Intl. Business Machine Corp.	45.3%	51.5%	6.2%	0	1	1
Kinder Morgan Inc.	30.6%	41.4%	10.7%	0	0	0
MBNA Corp.	50.8%	56.5%	5.6%	1	1	0

(*continued on next page*)

TABLE 2 (continued)

	Votes For as a Percentage of Votes Cast			**Proposal Approval (1 = Yes) (according to firm's approval rule)**		
	2003	**2004**	**Change**	**2003**	**2004**	**Change**
Peoplesoft	46.7%	52.9%	6.3%	0	1	1
R. R. Donnelley & Sons Co.	40.2%	53.3%	13.2%	0	1	1
Safeway Inc.[d]	61.2%	50.7%	−10.6%	1	1	0
Siebel Systems Inc.[e]	31.7%	49.1%	17.3%	0	0	0
Teco Energy Inc.	45.8%	47.4%	1.6%	0	0	0
Unitedhealth Group Inc.	47.1%	51.5%	4.4%	0	1	1
Vectren Corp.	42.5%	43.6%	1.1%	0	0	0
Wells Fargo & Co./Mn	56.3%	58.2%	1.9%	1	1	0
Weyerhauser Co.	50.0%	62.4%	12.4%	1	1	0
Yahoo! Inc.	33.7%	45.0%	11.4%	0	0	0
Average	43.0%	49.1%	6.1%	22.7%	54.5%	31.8%

Number of firms experiencing ...

... an increase in voting support: 20

... a decrease in voting support: 2

Percentage of firms experiencing a switch to ...

... approval if not approved in 2003: 41.2%

... no approval if approved in 2003: 0.0%

Sources: Proxy Statements and 10-Qs.

[a] In some firms the approval rule called for votes FOR to exceed the sum of votes FOR, AGAINST, and ABSTAINING; in the other firms, it only required votes FOR to exceed votes AGAINST.

[b] In this calculation we assume all insiders voted against the proposal, as for all firms the proxy statements indicate that board and management opposed the proposals. Hence, we re-define:

% Votes For = Votes For/(Votes For + Votes Against − Insider Votes), and

% Votes Against = (Votes Against − Insider Votes)/(Votes For + Votes Against − Insider Votes).

[c] We identify the following union pension funds among the sponsors of the proposals:

AFL-CIO Reserve Fund
Connecticut Retirement Plans
Culinary Workers Union Local 226
Intl. Brotherhood of Teamsters
Laborers Intl Union of North America
SEIU Master Trust
Central Pension Fund of the Intl. Union of Operating Businesses and Participating Employees
Amalgamated Bank
American Federation of State, County and Municipal Employees Pension
Central Laborers Pension, Welfare, & Annuity Funds
International Brotherhood of Electrical Workers' Pension Benefit Fund
Sheet Metal Workers' International Association
The Advisors' Inner Circle Fund/United Assoc. S&P500 Index Fund
United Brotherhood of Carpenters and Joiners of America
United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry

[d] Safeway decided to voluntarily expense ESOs after being targeted for the second time but before the annual meeting (where a vote was taken nonetheless). This may explain the lower voting support in 2004.

[e] If abstention votes were not counted, in 2004 the proposal at Siebel would have been approved.

averaged 56.9 percent, and represented the majority (of non-insider votes) in 72 percent of the firms (77 out of 107, untabulated).

Shareholder support increased over time, 60 percent of ESO expensing proposals being approved in 2004 compared to 41.7 percent in 2003 (see the third row of Table 2, Panel A). Notably, 69.2 percent of 13 proposals presented for the first time in 2004 were approved, but voting support also increased in firms targeted both in 2003 and 2004,[16] perhaps due to the perception that ESO expensing was unavoidable in the wake of the FASB Exposure Draft issued in March 2004. The favorable voting outcomes, combined with high voter turnout and low abstention rates (Table 2, Panel A), suggest that shareholders believed the proposals, despite their non-binding nature, were likely to influence management and board behavior.

Proponents' Motivation

Table 2, Panel A reveals that 90 percent of ESO expensing proposals were sponsored by union pension funds that held shares in the targeted firms. The ESO expensing initiative was launched in the summer of 2002 by a group of union pension funds led by the United Brotherhood of Carpenters and Joiners of America (UBCJA), a representative of which told us that the objective was to persuade the FASB to reconsider the accounting treatment of ESO and generate debate on the effectiveness of option-based compensation and executive compensation in general. According to UCBJA, excessive use of stock options and their distorted incentive effects had negatively affected pension fund values. Hence, lobbying for the expensing of ESO was viewed as consistent with the objective to maximize pension fund returns.

Labor unions had over the past 15 years been playing an increasingly significant role as shareholder activists through their pension funds, sponsoring approximately 26 percent (48 percent) of all governance-related (compensation-related) proposals submitted under Rule 14a-8 between 1997 and 2004, peaking at more than 40 percent (65 percent) in 2003–2004 (Ertimur, Ferri, and Stubben 2008).[17] Schwab and Thomas (1998) suggest that a key objective of shareholder activism by unions (in addition to maximizing pension fund value) was greater involvement in strategic corporate decisions. By sponsoring widely supported corporate governance proposals (e.g., redemption of poison pills, declassification of boards of directors), unions had tried to enhance their credibility as sophisticated players in the investment community and capture the attention of directors often less inclined to grant them the same informal communication opportunities accorded other institutional investors.

In this respect, proposals to expense ESO proffered four appealing features. First, wide support for ESO expensing among institutional investors (e.g., McKinsey & Company 2002) suggested a high probability of a successful voting outcome. Second, it represented a new, unique proposal (the first-ever on an accounting issue) for which unions would be given full credit. Third, although technically focused on an accounting treatment, the initiative would attract attention to executive pay and thus had the potential to affect executive pay practices, an area in which prior shareholder proposals had not been effective (Johnson and

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[16] The percentage of Votes For increased in 20 of the 22 firms targeted in both 2003 and 2004 (see Table 2, Panel B), resulting in approval of the proposal in 41.2 percent of the firms in which it had been rejected in 2003 including some high-profile cases among tech firms such as Hewlett-Packard, IBM, and Intel.

[17] The increasing use of shareholder proposals by union pension funds begs the question of why they file proposals rather than "vote with their feet" by selling stock in firms with an undesirable governance practice (in this case, lack of ESO expensing). However, "voting with their feet" is a more attractive option for actively managed funds in response to a firm-specific issue than for indexed funds (such as union pension funds) in response to systemic, market-wide issues (such as ESO expensing). In the second case, promoting an initiative with a potential for significant spillover effects is viewed as a superior strategy (for a discussion, see Black 1990; Del Guercio and Hawkins 1999). In addition, since no firm was expensing ESO until the summer of 2002, in our setting "voting with their feet" would have been equivalent to exiting the equity market.

Shackell 1997; Thomas and Martin 1999) and traditionally of great interest to unions.[18] Finally, the proposal afforded unions an opportunity to influence the standard-setting process on a topic of great visibility.

Characteristics of Targeted Firms

The characteristics of targeted firms are likely to reflect the proponent's motivations. Both of the unions' stated objectives, change the accounting treatment of ESO and spur debate on compensation practices, were more likely to be achieved if the proposals received high voting support, if the votes generated significant media attention, and if the target firms were regarded as broadly representative of the underlying population. The unions claimed to be targeting an approximately "random" sample of firms, but explicitly biased toward *large* firms more likely to receive extensive press coverage.[19] Indeed, Ferri et al. (2008) found the targeted firms to be distributed across multiple industries and about five times larger than the average Compustat firm ($27.1bn versus $5.3bn in total assets).

Using a logit regression over the two-year window 2003–2004, we try to infer empirically other targeting criteria possibly used by the proponents by comparing targeted firms with the control sample of S&P 500 firms described earlier. Following Ferri et al. (2008), we include the number of options held by the CEO (scaled by total shares outstanding, *OPTCEO*), an indicator variable for high-tech firms (dummy *HITECH*), and the magnitude of the pro forma ESO expense disclosed in the footnotes under SFAS No. 123 (scaled by the market value of equity, *OPTEXPENSE*).[20] We also include the percentage of unionized employees (*UNION*) to capture other unions' objectives in targeting a firm.[21]

Finally, we include a number of control variables found in prior studies to be associated with the likelihood of being targeted by shareholder proposals (e.g., Bizjak and Marquette 1998; Johnson and Shackell 1997; Karpoff et al. 1996; Strickland et al. 1996; Thomas and Cotter 2007; Wahal 1996). These include firm characteristics such as size (natural logarithm of the market value of equity, *LNMVE*), growth options (market-to-book value of equity, *MB*), past performance (cumulative three-year stock returns, *RETURNS*), and leverage (debt to total assets ratio, *LEVERAGE*) as well as ownership and governance characteristics such as the percentage of equity held by institutional investors (*INSTOWN*) and executives (*EXECOWN*) and the percentage of the top five executives serving on the board of directors (*EXECONBOARD*).

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[18] In 1997 the AFL-CIO launched the Executive Paywatch Website to monitor CEO pay trends and denounce cases of excessive pay, with emphasis on the growing gap between pay levels for CEOs and average workers. Since then, unions have been the major proponent of compensation-related proposals, accounting for 65 percent of them in 2003–2004 (Ertimur, Ferri, and Stubben 2008). Most compensation-related proposals submitted during the 1990s by union funds focused on the independence of the compensation committee and levels of CEO pay, whereas over the last few years most proposals have focused on creating a better link between pay and performance (e.g., through the use of performance-based options) and giving shareholders a vote on golden parachutes and supplemental executive retirement benefits (Ertimur, Ferri, and Muslu 2008).

[19] In the words of Edward Durkin, director of corporate affairs at United Brotherhood of Carpenters and Joiners of America, "We aren't singling out any companies in particular ... We are targeting a broad range of companies. So at the end of the (proxy) season, we can take to FASB and the business community votes by shareholders saying it's time to expense options" (Pensions & Investments 2003).

[20] Ferri et al. (2008) argue that proponents would prefer to target firms with high use of executive stock options, such as high-tech firms or firms in which CEOs hold a large amount of options, on the ground that voting shareholders in these firms would support ESO expensing as a way to curb excessive use of stock options and mitigate executives' incentives to artificially inflate earnings. They also argue that, all else being equal, proponents would target firms with lower magnitudes of pro forma option expense because some voting shareholders might vote against ESO expensing out of concern for negative effects associated with lower reported income.

[21] Critics argue that unions engage in shareholder activism to gain bargaining power over future wage and benefit negotiations rather than to maximize the value of the union pension fund (Agrawal 2008).

However, in our sample, the unions sponsoring the proposals represent employees from the respective firms only in four of the 153 targeted firms. Nonetheless, to allow for the possibility that unions may strategically coordinate their activities to avoid the appearance of a conflict of interest, we define *UNION* as the percentage of unionized employees, regardless of whether one of the unions representing the employees at the targeted firm is the union sponsoring the proposal. Thirteen percent of the targeted firms have at least some unionized employees.

Consistent with Ferri et al. (2008), Table 3 shows that, relative to the other S&P 500 firms, firms with higher CEO option holdings (*OPTCEO*), lower magnitude of disclosed ESO expense (*OPTEXPENSE*), and high-tech firms (*HITECH*) are more likely to be targeted. Targeted firms also tend to have higher *LEVERAGE* (Karpoff et al. 1996) and lower institutional ownership *INSTOWN* (Johnson and Shackell 1997).

Replicating these analyses separately for 2003 and 2004, we find the results (untabulated) to be unchanged, except that *RETURNS* and *EXECONBOARD* become significantly and negatively related to a firm's probability of being targeted, consistent with prior research (Ertimur, Ferri, and Stubben 2008; Wahal 1996). Note that in none of these specifications does the percentage of unionized employees (*UNION*) appear to be a significant selection criterion. We use the logistic model in Table 3 to account for a potential selection bias in the analysis of the consequences of ESO expensing proposals.[22]

V. EVIDENCE OF WHETHER SHAREHOLDER PROPOSALS AFFECT THE ADOPTION OF ESO EXPENSING

Research Design

To test Prediction 1a (the effect of being targeted on the likelihood to expense ESO) we employ the following logit regression:

$$\begin{aligned}\Pr(VOLEXP_i = 1) = {} & \alpha_0 + \alpha_1 * TARGETING_i + \alpha_2 * PEER\_VOLEXP_i \\ & + \alpha_3 * INSTOWN_i + \alpha_4 * ISSUE_i + \alpha_5 * ACQ_i \\ & + \alpha_6 * DEBTEQ_i + \alpha_7 * INTCOV_i + \alpha_8 * BONUS_i \\ & + \alpha_9 * CEOOWN_i + \alpha_{10} * ODIRGRANT_i \\ & + \alpha_{11} * LNMVE_i + \alpha_{12} * PROFIT_i \\ & + \alpha_{13} * OPTTOP5_i + \alpha_{14} * OPTEXPENSE_i \\ & + \alpha_{15} * IndustryDummies + \varepsilon_i. \end{aligned} \tag{1}$$

Our research question is whether *after* being targeted by an ESO expensing proposal (dummy *TARGETED*) a firm is more likely to voluntarily adopt ESO expensing (dummy *VOLEXP* = 1 if the firm voluntarily expenses options, and 0 otherwise). The date a firm receives a proposal is not observable. Under Rule 14a-8, a proposal must be submitted at least 120 prior to the proxy mailing date. Hence, any adoption of ESO expensing announced after this deadline is certainly occurring after the proposal was received. Adoptions announced before the deadline might have occurred before or after the targeting date. There are only seven such cases in our sample of targeted firms. We exclude three of these because they announced their decision to expense ESO more than 100 days before the deadline

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[22] The explanatory power of the model appears to be low (pseudo $R^2 = 0.07$). Note, though, that (1) we are already implicitly controlling for size, the main selection criterion (Ferri et al. 2008), by focusing on the S&P 500 firms, (2) a low explanatory power (after controlling for the S&P 500 membership) is consistent with the union pension funds' objective to target a random sample of firms, (3) the values of the pseudo R^2 cannot be naturally interpreted, there being no standard by which to assess whether the value is "large enough" (Greene 2003, 683; Long 1997, 105). Thus, a pseudo R^2 of 0.07 does not imply that the fit of the model is inadequate.

TABLE 3
Characteristics of Firms Targeted by an ESO Expensing Proposal Logit Model Comparing the Targeted Sample to S&P 500 Firms

Sample: [All targeted firms] + [all non-targeted S&P 500 firms that were not voluntarily expensing ESO as of the end of 2002], with available data in Compustat (financial variables), CRSP (stock returns), ExecuComp (compensation and governance variables), Thomson Financial (institutional ownership), and the 10-Ks or Bureau of Labor Statistics (union data).

	Expected	**Dep. Variable = 1 if Firm Targeted[a] (p-value)**
Constant		1.101 (0.401)
OPTCEO	+	0.202 (0.065)
OPTEXPENSE	−	−11.22 (0.082)
EXECOWN	−	0.214 (0.960)
INSTOWN	+/−	−3.605 (<0.001)
LNMVE	+	−0.019 (0.564)
MB	−	0.011 (0.764)
RETURNS	−	−0.001 (0.498)
LEVERAGE	+	1.583 (0.028)
EXECONBOARD	−	−0.911 (0.128)
HITECH	+	0.576 (0.087)
UNION	+	0.002 (0.404)
Pseudo R^2 (n)		7.4% (369)

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p-values are one-tailed for directional predictions and two-tailed otherwise.

[a] All explanatory variables are measured at the beginning of 2003. The dependent variable is measured over the two-year window 2003–2004.

Variable Definitions:

OPTCEO = number of options held by the CEO scaled by total shares outstanding;
OPTEXPENSE = option expense (as disclosed in 10-K footnotes under SFAS No. 123) scaled by market value of equity;
EXECOWN = percentage of shares held by top five executives;
INSTOWN = percentage of shares held by institutional investors;
LNMVE = natural logarithm of market value of equity;
MB = market-to-book value ratio;
RETURNS = cumulative three year stock returns as of the end of 2002;
LEVERAGE = total debt divided by total assets;
EXECONBOARD = fraction of top five executives sitting on the board of directors;
HITECH = dummy equal to 1 for firms in high-tech industry, and 0 otherwise; and
UNION = fraction of employees unionized, calculated using firm-level data from the 10-Ks where available (approx. 50% of the cases), else proxied by the industry average (source: Bureau of Labor Statistics).

for proposal submission (see Table 1, Panel A). In the other four cases, the decision was announced 7, 26, 27, and 34 days before the deadline. Assuming that these four firms announced their decision to expense ESO after receiving the proposal, we code them as *VOLEXP* = 1. The results are robust to their exclusion.

To test Prediction 1b (the effect of the voting outcome on the subsequent ESO expensing decision), we restrict the analysis to the subsample of firms in which the proposal was voted on and replace the independent variable *TARGETED* in Equation (1) with *VOTESFOR,* the percentage of votes cast in favor of the proposal. We do not use an indicator variable (approved versus not approved) because there were no cases of adoption of ESO expensing in firms in which the proposal was not approved. For firms in which a vote occurred both in 2003 and 2004 (Table 2, Panel B) we include only one observation per firm, using the 2004 voting outcome.[23] The results are robust to using only the 2003 voting outcome.

To test Prediction 1c (the effect of the shareholder proposals on the subsequent ESO expensing decision by non-targeted firms within the same industry), we restrict our sample to non-targeted firms and replace the independent variable *TARGETED* in Equation (1) with the indicator variable *PEER_TARGETED,* which is equal to 1 if at least one other firm within the same four-digit SIC was previously targeted by an ESO expensing proposal, and 0 otherwise. For all non-targeted sample firms with *PEER_TARGETED* = 1, the announcement of ESO expensing (if any) occurs after the (earliest) date one of the peer firms is targeted by the proposal.

We control for other potential determinants of a firm's decision to expense ESO analyzed in Aboody et al. (2004). Voluntary adoption of ESO expensing might be used to signal favorable future prospects in firms with higher information asymmetries and capital market activity. Hence, we predict a higher likelihood of ESO expensing in firms with higher information asymmetry (measured as a lower percentage of institutional ownership, *INSTOWN*) and higher capital market activity, that is, firms that issued equity to raise cash (dummy *ISSUE*) or acquire another firm (dummy *ACQ*) during the previous three fiscal years, or firms with a high debt to equity ratio (*DEBTEQ*) and high interest coverage (*INTCOV*).

Due to management's private incentives, the likelihood of expensing might be higher in cases in which the CEO bonus is a lower fraction of total pay (*BONUS*) and equity ownership by the CEO (*CEOOWN*) and outside directors (*ODIRGRANTS*) is higher, assuming positive valuation effects from the expensing announcement (Aboody et al. 2004). Also, ESO expensing might be more likely in firms subject to larger political costs, measured in terms of firm size (the natural log of the market value of equity, *LNMVE*), profitability (net income scaled by market value of equity, *PROFIT*), and fraction of all options granted to the top five executives (*OPTTOP5*).

To complete the set of determinants of ESO voluntary adoption described by Aboody et al. (2004), we control for the magnitude of the pro forma option expense disclosed under SFAS No. 123 (scaled by market value of equity, *OPTEXPENSE*). The relation between *OPTEXPENSE* and the decision to expense ESO is unclear. A higher level of *OPTEXPENSE,* although it results in a larger negative impact on net income, might also yield higher signaling benefits.

All the variables described above are measured at the end of 2002. Because by that time more than 200 firms had already adopted ESO expensing, we also control for the percentage of firms within the same four-digit SIC that had decided to expense ESO by the end of 2002, *PEER_VOLEXP*. Finally, we control for industry effects (based on Core and Guay [1999]).

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[23] The only exception is Safeway, for which we include the voting outcome in 2003 because the firm announced the decision to expense ESO before the 2004 vote (see notes to Table 2, Panel B).

Empirical Results

The univariate analyses in Table 4 are consistent with Predictions 1a and 1b. Firms targeted by an ESO expensing proposal are significantly more likely to subsequently announce their decision to voluntarily expense ESO than non-targeted firms in our S&P 500 control sample. Likewise, among the subsample of targeted firms receiving a vote, the proposal's approval (resulting from a majority of votes in favor) is associated with a significantly higher likelihood of expensing ESO. There was not a single case of adoption of ESO expensing among the firms in which the proposal was not approved. Hence, to test the effect of voting outcome (Prediction 1b) in the multivariate logit regression, we include the percentage of votes in favor of the proposal (*VOTESFOR*) rather a dummy variable denoting the proposal's approval.

Table 5 presents a multivariate analysis of Prediction 1. In Model 1, the coefficient on *TARGETED* is positive (+1.142) and statistically significant (p-value = 0.001), consistent with Prediction 1a.[24] In terms of economic significance, this coefficient implies that the presence of a proposal is associated with an increase of 10.65 percentage points in the probability of subsequent adoption of ESO expensing, from 5.99 percent (when TARGETED = 0) to 16.64 percent (when TARGETED = 1).[25]

To partially address the concern that firms might have been targeted for reasons related to the likelihood of expensing ESO, we incorporate a correction for endogeneity using a two-stage approach. In the first stage, we predict the probability of being targeted using the model in Table 3. In the second stage, we use the predicted probabilities (*TARGETED_HAT*) in place of the *TARGETED* dummy. The sample size drops from 409 to 346 observations due to missing variables in the first stage. Our main result is confirmed: the coefficient on *TARGETED_HAT* remains positive (+5.379) and significant (p-value = 0.045).

In Model 2, the coefficient on *VOTESFOR* is also positive (+21.21) and statistically significant (p-value = 0.028), indicating a higher frequency of adoption among firms in which the proposal received higher voting support, consistent with Prediction 1b.[26]

In Model 3 we examine the effect on non-targeted firms *only* when a peer firm is targeted by a proposal. The positive and significant coefficient on *PEER_TARGETED* (+0.70, with p-value = 0.099) suggests a statistically higher likelihood of voluntary adoption of ESO expensing by non-targeted firms when peer firms are targeted, providing support for Prediction 1c. In terms of economic significance, the coefficient implies that the presence of a peer firm targeted by a proposal is associated with an increase of 2.76 percent

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[24] When we exclude the four firms for which it is unclear whether the proposal was submitted before the announcement of the decision to expense ESO, the coefficient on *TARGETED* becomes 1.019 (p-value = 0.003).

[25] We obtain this estimate assuming that all the independent variables other than *TARGETED* are equal to their sample means. If the independent variables are assumed to be equal to their sample median (rather than mean) values, the estimated increase in probability is 8.05 percent.

[26] When we use the voting outcome from 2003 rather than from 2004 for the firms targeted twice, the coefficient on *VOTESFOR* remains significant (+26.08, with a p-value = 0.038). This is not surprising because none of the firms targeted in both 2003 and 2004 announced the adoption of ESO expensing, except the firm (Safeway) that announced the decision to expense ESO few days before the 2004 vote (see notes to Table 2, Panel B).

TABLE 4
Effect of Option Expensing Proposals on Voluntary Adoption of Option Expensing Univariate Analyses

			% Firms Announcing to Expense ESO in 2003–2004		p-values	
Variable	**Sample**	**Subsample**	**Mean Values**	**Difference in Means**	**t-test**	**Wilcoxon test**
Proposal Effect:						
Comparison of the frequency of adoption of ESO expensing between targeted and non-targeted firms	[All targeted firms] and [all non-targeted S&P 500 firms that were not voluntarily expensing ESO as of the end of 2002]	Targeted[a]	23.4%	14.2%	0.001	<0.001
		Not Targeted	9.2%			
Voting Outcome Effect:						
Comparison of the frequency of adoption of ESO expensing between firms in which the proposal was approved and firms in which it was not approved	Only targeted firms in which the proposal was voted upon	Approved	15.2%	15.2%	0.007	0.012
		Not Approved	0%			

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p-values are two-tailed.

[a] The targeted sample includes three firms that expensed ESO at the end of 2002 (rather than in 2003–2004) because they were targeted by a proposal for the proxy season of 2003 (i.e., a proposal that would be voted upon in 2003).

TABLE 5
Effect of Option Expensing Proposals on Voluntary Adoption of Option Expensing
Logit Model Comparing Targeted Firms with S&P 500 Firms

(Dep. Var. = 1 if firm announced to voluntarily expense options in 2003 or 2004, 0 otherwise)[a]

Sample: [All targeted firms] + [all non-targeted S&P 500 firms that were not voluntarily expensing ESO as of the end of 2002], with available data in Compustat (financial variables), ExecuComp (compensation and governance variables), Thomson Financial (institutional ownership), and Security Data Corporation (acquisitions and equity issuance). Relative to the main sample used in Model 1 and described above, Model 2 includes only targeted firms receiving a vote, and Model 3 excludes all firms targeted by an ESO expensing proposal.

	Expected	Model 1 (p-value)	Model 2 (p-value)	Model 3 (p-value)
Constant		−3.868	−0.559	−3.994
		(0.050)	(0.938)	(0.202)
TARGETED	+	1.142		
		(0.001)		
VOTESFOR	+		21.21	
			(0.028)	
PEER_TARGETED	+			0.700
				(0.099)
Control Variables				
PEER_VOLEXP	+	5.104	−52.22	5.862
		(0.066)	(0.898)	(0.098)
INSTOWN	−	−1.189	−7.891	−1.104
		(0.168)	(0.102)	(0.294)
ISSUE	+	0.939	1.226	0.827
		(0.007)	(0.226)	(0.086)
ACQ	+	−0.267	0.402	0.434
		(0.749)	(0.423)	(0.233)
DEBTEQ	+	0.064	1.953	0.101
		(0.286)	(0.057)	(0.250)
INTCOV	+	−0.0002	−0.002	−0.0003
		(0.914)	(0.954)	(0.920)
BONUS	−	−0.208	2.974	−1.591
		(0.380)	(0.778)	(0.056)
CEOOWN	+	−18.53	−14.92	−12.35
		(0.992)	(0.651)	(0.913)
ODIRGRANT	+	605.8	8435	−20980
		(0.400)	(0.226)	(0.957)
LNMVE	+	0.276	−0.780	0.181
		(0.050)	(0.880)	(0.250)
PROFIT	+	−0.097	15.82	−1.644
		(0.560)	(0.220)	(0.874)
OPTTOP5	+	−0.199	−7.436	0.639
		(0.570)	(0.812)	(0.340)
OPTEXPENSE	+/−	1.382	−113.5	−16.28
		(0.902)	(0.235)	(0.564)

(*continued on next page*)

TABLE 5 (continued)

	Expected	Model 1 (p-value)	Model 2 (p-value)	Model 3 (p-value)
Industry Dummies[b]		Yes	No	Yes
Pseudo R^2 (n)		21.0% (409)	50.2% (83)	25.6% (284)

p-values are one-tailed for directional predictions and two-tailed otherwise.

[a] The targeted sample includes three firms that expensed ESO at the end of 2002 (rather than in 2003–2004) because they were targeted by a proposal for the proxy season of 2003 (i.e., a proposal that would be voted upon in 2003).

[b] The model includes indicator variables denoting the firm's industry membership based on the industry classification in Core and Guay (1999). The industry-specific intercepts are untabulated.

Both the dependent and the independent variables of interest are measured over the two-year window 2003–2004. The control variables are measured as of the end of 2002.

Variable Definitions:

TARGETED = dummy equal to 1 if the firm was targeted by an ESO expensing proposal in the proxy season of 2003–2004;
VOTESFOR = votes in favor divided by the sum of votes in favor and votes against the ESO expensing proposal;
PEER_TARGETED = dummy equal to 1 if at least one firm with the same SIC four-digit code was previously targeted by an ESO expensing proposal, and 0 otherwise;
PEER_VOLEXP = percentage of firms with the same SIC four-digit code that had already announced their intention to expense ESO by the end of 2002;
ISSUE = indicator variable equal to 1 if the firm issued equity during the last three fiscal years, and 0 otherwise;
ACQ = indicator variable equal to 1 if the firm used equity to acquire another firm during the last three fiscal years, and 0 otherwise;
DEBTEQ = ratio of long-term debt to shareholder's equity;
INTCOV = rank variable based on the firm's ratio of interest expense to operating income; lower levels indicate better coverage and higher levels indicate lower coverage; cases in which the ratio is negative (due to negative operating income) are given the highest ranking score;
BONUS = ratio of CEO cash bonus to total cash compensation;
CEOOWN = equity shares and options held by the CEO as a percentage of shares outstanding;
ODIRGRANT = equity shares and options granted to outside directors as a percentage of shares outstanding;
INSTOWN = percentage of shares outstanding held by institutional investors;
LNMVE = logarithm of year-end market value of equity;
PROFIT = net income deflated by market value of equity;
OPTTOP5 = fraction of total options granted in a given year that is granted to the top five executives; and
OPTEXPENSE = option expense (as disclosed in 10-K footnotes under SFAS No. 123) scaled by market value of equity.

in the probability of subsequent adoption of ESO expensing (from 2.87 percent when *PEER_TARGETED* = 0 to 5.63 percent when *PEER_TARGETED* = 1).[27]

VI. EVIDENCE OF WHETHER SHAREHOLDER PROPOSALS AFFECT CEO COMPENSATION

Research Design

To examine whether ESO expensing proposals affect CEO pay practices at targeted firms (Prediction 2), we compare changes in the level and composition of CEO pay at targeted and S&P 500 control sample firms. We exclude firms hiring a new CEO to avoid the effect of one-time compensation choices (e.g., severance payments to outgoing CEOs, mega-grants to incoming CEOs). Also, firms targeted only in 2003 are not part of the control sample for 2004.

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[27] With respect to the control variables, it appears that firms issuing equity (*ISSUE*) are more likely to adopt ESO expensing, presumably to signal favorable prospects (Aboody et al. 2004). Notably, the percentage of peer firms already expensing options (*PEER_VOLEXP*) is significant in both Models 1 and 3, consistent with early adopters in 2002 leading firms in the same industry to follow suit in 2003 and 2004.

Change in the Level of CEO Compensation

To test the impact of the ESO expensing proposals on the level of CEO compensation (Prediction 2a), we regress the change in CEO compensation ($\Delta LNCEOCOMP_{it}$), measured as the value of the natural logarithm of CEO total compensation[28] at firm i in fiscal year t minus the value in $t-1$, on a dummy indicating whether the firm was targeted by a proposal to be voted on in fiscal year $t-1$ ($TARGETED_{it-1}$) and a number of control variables.

$$\begin{aligned}\Delta LNCEOCOMP_{it} = {} & \alpha_0 + \alpha_1 TARGETED_{it-1} + \alpha_2 * \Delta ROA_{it} + \alpha_3 * RET_{it} \\ & + \alpha_4 * LNSIZE_{it-1} + \alpha_5 * MB_{it-1} + \alpha_6 * R\&D \\ & + \alpha_7 * CEOOWN_{it-1} + \varepsilon_{it}. \end{aligned} \tag{2}$$

For a firm with fiscal year ending December 2002 and the vote taking place in April 2003, we measure compensation changes from 2003 (the year of the vote) to 2004. In doing so, we assume that changes in pay will be reflected in the year after the proposal is (or was supposed to be) voted upon. As a significant proportion of CEO pay is determined at the beginning of each fiscal year, changes are unlikely to occur until the following year (Core et al. 1999).

Previous research finds widespread evidence that performance measures, particularly stock price returns and earnings, are commonly used in compensation contracts (Lambert and Larcker 1987; Murphy 1999; Sloan 1993). We account for changes in performance by including controls for stock returns (*RET*) and changes in the return on assets (ΔROA). We also control for variables identified in prior studies as key determinants of executive pay: size (the natural logarithm of total assets, *LNSIZE*), market-to-book value of equity (*MB*), R&D expenditures (scaled by total assets, *R&D*), and CEO percentage ownership (*CEOOWN*). Many studies find that larger firms provide higher CEO compensation, consistent with the notion that these firms have higher monitoring costs and require more skilled managers (e.g., Gabaix and Landier 2008; Rosen 1982). Higher levels of executive pay have also been documented in firms with higher growth options and firms with more R&D (e.g., Cheng 2004; Smith and Watts 1992), perhaps because these firms require higher quality managers and make greater use of risky pay (requiring a higher risk premium). Finally, although greater CEO ownership might better align CEO interests with those of shareholders, resulting in lower compensation (Core et al. 1999), it might also enable CEOs to exercise more power in negotiating their compensation, resulting in higher pay. We do not have directional predictions for these variables because our dependent variable is defined in terms of changes rather than levels. Nonetheless, we include the level of these variables to allow for the possibility of an effect on changes in CEO pay (Baber et al. 1996). In robustness tests, we redefine these control variables in terms of their change over the year prior to the proposal.

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[28] Total compensation is defined as the sum of the CEO's salary, bonus, value of restricted stock granted, Black-Scholes value of options granted, long-term incentive payouts, and all other forms of annual compensation.

Change in the Composition of CEO Compensation

We test the impact of ESO expensing proposals on the weight assigned to ESO in the CEO compensation contract. This analysis is useful for two reasons. First, it helps us to understand whether the source of any change in compensation level is due to less use of ESO. Second, it allows for the possibility that ESO expensing proposals affected the composition of CEO pay, even if the level of total compensation was not affected.

We regress the variable $\Delta CEOOPTCOMP_{it}$ (the Black-Scholes value of the options granted to the CEO scaled by CEO total compensation in fiscal year t minus the value in fiscal year $t-1$) on the $TARGETED_{it-1}$ dummy and control variables:

$$\begin{aligned}\Delta CEOOPTCOMP_{it} = {} & \beta_0 + \beta_1 TARGETED_{it-1} + \beta_2 * LNSIZE_{it-1} \\ & + \beta_3 * MB_{it-1} + \beta_4 * R\&D_{it-1} + \beta_5 * CEOOWN_{it-1} \\ & + \beta_6 * CASHSHORT_{it-1} + \beta_7 * STDRET_{it-1} + e_t. \end{aligned} \tag{3}$$

We include several control variables related to the use of stock options. Because stock option compensation might be used as a substitute for cash compensation in firms with cash constraints (Core and Guay 1999; Yermack 1995), we control for the degree of cash flow shortfall (*CASHSHORT*), calculated as [(common and preferred dividends + cash flows from investment − cash flows from operations)/total assets]. Monitoring is more difficult in firms operating in noisy environments (Yermack 1995), resulting in greater reliance on stock option compensation. On the other hand, managerial risk aversion implies that the use of stock options in the compensation package will increase at a decreasing rate relative to noise (Core and Guay 1999). We control for the effect of noise by using the natural logarithm of the standard deviation of a firm's monthly stock returns during the fiscal year $t-1$ (*STDRET*). Finally, as in Regression (2), we control for *LNSIZE, MB, R&D,* and *CEOOWN.* Firm size, growth, and R&D intensity are associated with higher monitoring costs, which lead to greater use of stock options. CEO ownership, on the other hand, is typically related to fewer agency conflicts resulting in less reliance on stock option compensation (Baber et al. 1996; Core and Guay 1999; Demsetz and Lehn 1985; Smith and Watts 1992; Yermack 2004). Again, we make no directional predictions for these control variables.

We use OLS regressions to test Equations (2) and (3), and include all companies in fiscal years 2004 and 2005. We include firm random effects to mitigate serial correlation in residuals.

To test the effect of the voting outcome (Prediction 2b), we modify Equations (2) and (3) as follows. First, we split the *TARGETED* dummy into two indicator variables, depending on whether a vote took place, *TARGETED_Vote* and *TARGETED_NoVote.* Then we further split the *TARGETED_Vote* dummy into two indicator variables, depending on whether the proposal was approved or not, *TARGETED_Approved* and *TARGETED_Not Approved.*

Empirical Results

The univariate analysis in Table 6, Panel A under "Proposal Effect" suggests that targeted firms reported a slight decrease in the average level of CEO pay ($\Delta CEOCOMP$) in the year after receiving the proposal. This contrasts with the increase observed for the S&P 500 control firms. However, this difference is statistically insignificant. Interestingly, a significantly higher proportion of targeted firms decided not to grant any options to their CEOs (dummy variable *NOCEOGRANT*).

TABLE 6
Univariate Analysis: Effect of Option Expensing Proposals on Compensation[a]

Sample: [All targeted firms] + [all non-targeted S&P 500 firms that were not voluntarily expensing ESO as of the end of 2002]. Panel B restricts the sample to the subsample of targeted firms.

Panel A: Proposal Effect

Comparison of changes in compensation between targeted and non-targeted firms

	Difference in Means			p-values	
Variable	**Targeted**	**Not Targeted**	**Difference**	**t-test**	**Wilcoxon Test**
$\Delta CEOCOMP$	−75.7	523	−599	0.687	0.607
$\Delta CEOOPTCOMP$	−0.033	−0.035	0.002	0.949	0.674
$\Delta CEOOPTMVE$	−0.077	−0.064	−0.013	0.836	0.940
$\Delta TOTOPTIONS$	−0.003	−0.003	0	0.806	0.948
$NOCEOGRANT$	0.293	0.212	0.081	0.053	0.053

Panel B: Voting Outcome Effect

Comparison of changes in compensation between targeted firms in which the vote was approved and targeted firms in which the vote was not approved

	Difference in Means			p-values	
Variable	**Approved**	**Not Approved**	**Difference**	**t-test**	**Wilcoxon Test**
$\Delta CEOCOMP$	−1602	1792	−3394	0.411	0.566
$\Delta CEOOPTCOMP$	−0.084	0.0321	−0.116	0.069	0.079
$\Delta CEOOPTMVE$	−0.131	0.008	−0.139	0.365	0.371
$\Delta TOTOPTIONS$	−0.003	−0.001	−0.002	0.578	0.486
$NOCEOGRANT$	0.267	0.286	−0.019	0.845	0.848

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[a] We analyze the effects of the 2003 and 2004 proposals on changes in compensation occurring the year after the firm was targeted. In Panel B we focus on the subsample of targeted firms and analyze the effect of the voting outcome of the proposal on changes in compensation in the year after the vote took place.

Variable Definitions:

CEOCOMP = CEO total compensation including salary, bonus, value of restricted stock granted, Black-Scholes value of options granted, long-term incentive payouts, and all other forms of annual compensation (item TDC1 in the ExecuComp database);

CEOOPTCOMP = Black-Scholes value of total options granted to the CEO divided by *CEOCOMP*;

CEOOPTMVE = Black-Scholes value of total options granted to the CEO divided by market value of equity;

TOTOPTIONS = number of options granted by the firm to all employees during the year divided by shares outstanding;

$\Delta CEOCOMP$, $\Delta CEOOPTCOMP$, $\Delta CEOOPTMVE$, $\Delta TOTOPTIONS$ = value of *CEOCOMP*, *LNCEOCOMP*, *CEOOPTCOMP*, *CEOOPTMVE*, and *TOTOPTIONS* in fiscal year t minus the value in fiscal year $t-1$; and

NOCEOGRANT = dummy equal to 1 if the CEO did not receive an option grant in the fiscal year after the firm was targeted, and 0 otherwise.

When we restrict our analysis to firms in which the proposal was voted on (Table 6, Panel B), we observe a decrease in level of CEO compensation ($\Delta CEOCOMP$) and mix of options in CEO pay ($\Delta CEOOPTCOMP$) in firms in which the proposal was approved, *vis-à-vis* an increase in firms in which the proposal was not approved, although only the difference in $\Delta CEOOPTCOMP$ is statistically significant. In both Panel A and Panel B, there is no difference across subsamples in terms of changes in the use of employee stock options at the firm-wide level in the year following an ESO expensing proposal (variable *ΔTOTOPTIONS*).

Table 7, Panel A examines the effect of ESO expensing proposals on the change in level of CEO compensation in a multivariate setting. In Model 1 of Panel A, we examine the effect of a firm being targeted on the change in the natural logarithm of CEO compensation (*ΔLNCEOCOMP*). Consistent with Prediction 2a, the coefficient on *TARGETED* is significantly negative (p-value = 0.053).[29]

Model 2 suggests that the result is driven by targeted firms in which a vote eventually took place (negative coefficient on *TARGETED_Vote,* p-value = 0.074). This raises the question of whether the effect depends on the voting outcome. The answer to this question is provided by Model 3. The significantly negative coefficient on *TARGETED_Approved* implies an average decrease in CEO pay of $2.3 million in firms in which the proposal was approved relative to the control sample of non-targeted firms.[30]

The coefficient on *TARGETED_Approved* is also significantly more negative than the coefficient on *TARGETED_NotApproved* (p-value = 0.012, bottom of Panel A). This result suggests a lower change in CEO compensation in firms in which the proposal was approved, also relative to the firms in which the proposal was not approved, consistent with Prediction 2b.

Table 7, Panel B investigates the effect of ESO expensing proposals on the composition of CEO compensation, in particular, with respect to the change in the relative weight of ESO grants. In contrast to Prediction 2a, the results indicate an insignificant effect of being targeted (Model 1), regardless both of whether the proposal resulted in a vote at the annual meeting (Model 2) and the voting outcome (Model 3). However, the negative coefficient on *TARGETED_Approved,* although not significant (p-value = 0.146), is significantly lower than the coefficient on *TARGETED_NotApproved* (see the test for difference in coefficients; p-value = 0.026). In particular, holding all control variables (other than the *TARGETED_* variables) at their mean values, we find that the mix of ESO in CEO pay increased 3.2 percent in firms in which the proposal was not approved (*TARGETED_NotApproved* = 1 and *TARGETED_Approved* = *TARGETED_NoVote* = 0), but decreased 7.8 percent in firms in which it was approved (*TARGETED_Approved* = 1 and *TARGETED_NotApproved* = *TARGETED_NoVote* = 0). This shift away from ESO grants in CEO pay packages in firms in which the proposal was approved relative to firms in which it was not approved is consistent with Prediction 2b.

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[29] To mitigate endogeneity concerns (e.g., firms targeted for reasons related to their compensation practices), as robustness test we use a two-stage approach: in the first stage we predict the probability of being targeted using the model in Table 3 (estimated separately for 2003 and 2004); in the second stage we use the predicted probabilities (*TARGETED_HAT*) in place of the *TARGETED* dummy. The sample size drops from 656 to 582 observations. The coefficient on *TARGETED_HAT* remains negative (−0.783) although its significance becomes weak (p-value = 0.117).

[30] The −0.464 coefficient on *TARGETED_Approved* implies that the factor by which CEO pay increases (year-over-year) in a targeted firm in which the vote was approved is 62.9 percent ($e^{-0.464}$) of the factor by which CEO pay increases in non-targeted firms. To understand the economic significance of this result, consider that the median CEO pay in year $t-1$ is $6,748,700 and the predicted *ΔLNCEOCOMP*, holding all control variables at their mean values and setting all the *TARGETED* variables equal to zero, is 0.049. This means that in non-targeted firms CEO pay in year t was expected to be 105 percent (i.e., $e^{0.049}$) of CEO pay in year $t-1$ (i.e., an increase in CEO pay of $337,000). The proposal approval (*TARGETED_Approved* = 1) is associated with a decrease in the factor by which CEO pay changes from 105 percent to 66 percent (i.e., 105 percent * 62.9 percent), resulting in a decrease in CEO pay of $2.29 million.

TABLE 7
Multivariate Analysis: Effect of Option Expensing Proposals on CEO Compensation[a]

Panel A: Effect on Level of CEO Compensation

$$\Delta LNCEOCOMP_{it} = \alpha_0 + \alpha_1 TARGETED_{it-1} + \alpha_2 * \Delta ROA_{it} + \alpha_3 * RET_{it} + \alpha_4 * LNSIZE_{it-1} + \alpha_5 * MB_{it-1} + \alpha_6 * R\ \&\ D_{it-1} + \alpha_7 * CEOOWN_{it-1} + \varepsilon_{it}$$

Sample: [All targeted firms] + [all non-targeted S&P 500 firms that were not voluntarily expensing ESO as of the end of 2002], with available data in Compustat (financial variables), CRSP (stock returns), ExecuComp (compensation and ownership variables).

		ΔLNCEOCOMP		
	Expected	**Model 1**	**Model 2**	**Model 3**
Intercept		0.403	0.404	0.333
		(0.502)	(0.502)	(0.578)
TARGETED	−	−0.198		−0.165
		(0.053)		(0.209)
TARGETED_NoVote	−		−0.183	
			(0.186)	
TARGETED_Vote	−		−0.205	
			(0.074)	
TARGETED_NotApproved	+/−			0.080
				(0.674)
TARGETED_Approved	−			−0.464
				(0.006)
Control Variables				
ΔROA	+	2.281	2.284	2.213
		(0.002)	(0.002)	(0.002)
RET	+	0.172	0.172	0.212
		(0.132)	(0.132)	(0.086)
LNSIZE	+/−	0.002	0.001	0.009
		(0.974)	(0.976)	(0.855)
MB	+/−	0.002	0.002	0.002
		(0.311)	(0.312)	(0.299)
R&D	+/−	−1.091	−1.094	−0.964
		(0.460)	(0.459)	(0.512)
CEOOWN	+/−	0.651	0.660	0.276
		(0.673)	(0.670)	(0.859)
Industry Dummies[b]		Yes	Yes	Yes
Number of Observations		656	656	656
Number of Firms		414	414	414
R^2		7.6%	7.6%	8.5%

	Differences in Coefficients	**Chi-Squared**	**p-value**
Model 2	*TARGETED_Vote = TARGETED_NoVote*	0.01	(0.923)
Model 3	*TARGETED_Approved < TARGETED_NotApproved*	5.06	(0.012)

(*continued on next page*)

TABLE 7 (continued)

Panel B: Effect on Composition of CEO Compensation

$$\Delta CEOOPTCOMP_{it} = \beta_0 + \beta_1 TARGETED_{it-1} + \beta_2 * LNSIZE_{it-1} + \beta_3 * MB_{it-1} + \beta_4 * R\&D_{it-1} + \beta_5 * CEOOWN_{it-1} + \beta_6 * CASHSHORT_{it-1} + \beta_7 * STDRET_{it-1} + e_t$$

Sample: [All targeted firms] + [all non-targeted S&P 500 firms that were not voluntarily expensing ESO as of the end of 2002], with available data in Compustat (financial variables), CRSP (stock returns), ExecuComp (compensation and ownership variables).

		$\Delta CEOOPTCOMP$		
	Expected	**Model 1**	**Model 2**	**Model 3**
Intercept	+/−	0.118	0.118	0.110
		(0.421)	(0.425)	(0.454)
TARGETED	−	0.003		
		(0.552)		
TARGETED_NoVote	−		−0.013	−0.009
			(0.395)	(0.423)
TARGETED_Vote	−		0.009	
			(0.622)	
TARGETED_NotApproved	+/−			0.067
				(0.115)
TARGETED_Approved	−			−0.043
				(0.146)
Control Variables				
LNSIZE	+/−	−0.010	−0.010	−0.008
		(0.349)	(0.351)	(0.414)
MB	+/−	−0.0001	−0.0001	−0.0001
		(0.827)	(0.829)	(0.836)
R&D	+/−	−0.078	−0.074	−0.050
		(0.809)	(0.818)	(0.875)
CEOOWN	+/−	−0.179	−0.185	−0.252
		(0.580)	(0.567)	(0.438)
CASHSHORT	+/−	0.021	0.023	0.027
		(0.812)	(0.797)	(0.764)
STDRET	+/−	−0.021	−0.021	−0.022
		(0.392)	(0.383)	(0.368)
Industry Dummies[b]		Yes	Yes	Yes
Number of Observations		648	648	648
Number of Firms		410	410	410
R^2		3.0%	3.1%	3.6%

	Differences in Coefficients	**Chi-Squared**	**p-value**
Model 2	*TARGETED_Vote = TARGETED_NoVote*	0.17	(0.680)
Model 3	*TARGETED_Approved < TARGETED_NotApproved*	3.78	(0.026)

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p-values in parentheses are one-tailed for directional predictions and two-tailed otherwise.

[a] We analyze the effects of the 2003 and 2004 proposals on the changes in compensation practices occurring the year after the firm was targeted.

(*continued on next page*)

TABLE 7 (continued)

[b] The model includes indicator variables denoting the firm's industry membership based on the industry classification in Core and Guay (1999). The industry-specific intercepts are untabulated.

Variable Definitions:

CEOCOMP = CEO total compensation including salary, bonus, value of restricted stock granted, Black-Scholes value of options granted, long-term incentive payouts, and all other forms of annual compensation (item TDC1 in the ExecuComp database);

LNCEOCOMP = natural logarithm of *CEOCOMP*;

CEOOPTCOMP = Black-Scholes value of total options granted to the CEO divided by *CEOCOMP*;

Δ*CEOCOMP*, Δ*LNCEOCOMP*, Δ*CEOOPTCOMP* = value of *CEOCOMP*, *LNCEOCOMP*, and *CEOOPTCOMP* in fiscal year t minus the value in fiscal year $t-1$;

TARGETED = dummy equal to 1 if firm was targeted for a proposal, and 0 otherwise, during fiscal year $t-1$;

TARGETED_Vote = dummy equal to 1 if firm was targeted in fiscal year $t-1$ and the proposal was voted upon, and 0 otherwise;

TARGETED_NoVote = dummy equal to 1 if firm was targeted in fiscal year $t-1$ but the proposal was withdrawn, and 0 otherwise;

TARGETED_Approved = dummy equal to 1 if firm was targeted in fiscal year $t-1$ and the proposal was approved, and 0 otherwise;

TARGETED_NotApproved = dummy equal to 1 if firm was targeted in fiscal year $t-1$ and the proposal was not approved, and 0 otherwise;

APPROVED = dummy equal to 1 if the proposal was approved in fiscal year $t-1$, and 0 otherwise;

VOTESFOR = votes in favor divided by the sum of votes in favor and votes against the ESO expensing proposal;

ROA = income before extraordinary items divided by total assets | $\Delta ROA = ROA$ in fiscal year t minus ROA in fiscal year $t-1$;

RET = annual stock returns;

SIZE = total assets (\$MM)| *LNSIZE* = natural logarithm of *SIZE*;

MB = market-to-book value ratio;

CEOOWN = equity shares and options held by the CEO as a percentage of shares outstanding;

CASHSHORT = cash shortage measured as [(common and preferred dividends + cash flows from investment − cash flows from operations)/total assets]; and

STDRET = natural logarithm of the standard deviation of the firm's monthly stock returns over the fiscal year.

Robustness Tests

Prior studies suggest that shareholder proposals repeatedly submitted over many years might have a stronger impact on firms' governance practices, particularly in the case of a sequence of majority votes (Ertimur, Ferri, and Stubben 2008). To investigate whether our findings in Table 7, Panels A and B are driven by firms targeted in both 2003 and 2004, we run our analyses with only the 2003 observations for these firms. The tenor of our key results (untabulated) is unchanged.

Prior studies also suggest that ESO expensing might have affected CEO pay practices.[31] Hence, the CEO pay changes documented in Table 7 might be due to adoption of ESO expensing by some of the targeted firms rather than to the ESO expensing proposals. To explore this possibility, we add to our explanatory variables in Table 7 a dummy variable equal to 1 if the firm announced that it would voluntarily expense ESO in 2003 or 2004. Also, we split each of our variables of interest (e.g., *TARGETED* in Model 1) into two indicators, one for expensing and one for non-expensing firms (e.g., *TARGETED_Expense* and *TARGETED_No Expense*).

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[31] Seethamraju and Zach (2003) provide some evidence that firms voluntarily adopting ESO expensing in the summer of 2002 in that same year reduced the number of options granted to their employees and their top five executives, both in absolute terms and relative to a control sample matched on industry and size. Brown and Lee (2007) document a significant reduction in the use of ESO in total compensation for top five executives as a result of mandatory ESO expensing (FAS No. 123R), and show that such reduction resulted in a decrease in total compensation in firms with abnormally high executive compensation before FAS No. 123R.

Untabulated tests yield the following insights. First, across the various models, the dummy for voluntary expensing has no effect on changes in levels of CEO pay (Panel A), but has a negative and significant effect ($p\text{-value} < 0.10$) on the change in composition of CEO pay (Panel B). That is, firms voluntarily expensing ESO seem to reduce the weight of stock options in the CEO pay package. Second, and most important, all our results in Table 7 hold for the subset of targeted firms not expensing ESO. This means that our results are not driven by the subset of targeted firms expensing ESO. Third, the coefficients of interest for the subset of targeted firms expensing ESO are generally insignificant. A potential explanation is that targeted firms viewed the adoption of ESO expensing and changes in CEO compensation as substitute responses to the shareholder proposals and votes. However, these results should be interpreted with caution because some of the subsamples (e.g., targeted firms in which the proposal was approved and ESO expensing adopted) become relatively small.

Finally, when we replicate Table 7 using changes rather than levels for the control variables (other than the performance measures), all results on the variables of interest are unchanged.

In summary, Table 7 documents a negative association between ESO expensing proposals and subsequent changes in CEO pay levels and use of options in CEO pay, the association being largely due to cases in which the proposal was approved by voting shareholders. These results are driven neither by the presence of firms targeted twice nor by the contemporaneous adoption of ESO expensing by some of the targeted firms. Our evidence contrasts with previous findings of no significant consequences of pay-related shareholder proposals in the 1990s (Thomas and Martin 1999; Johnson and Shackell 1997).[32]

VII. CONCLUSIONS

Over the 2003 and 2004 proxy seasons, a group of unions and other shareholder activists targeted more than 150 firms with a proposal requesting adoption of the fair value method of accounting for employee stock options (ESO), the first time the SEC allowed shareholder proposals on an accounting matter.

We assess the economic consequences of these proposals by analyzing their association with the likelihood of expensing ESO and with CEO compensation practices in the subsequent period. We find that the presence of a shareholder proposal was positively associated with the likelihood of adoption of ESO expensing not only by targeted firms, but also by their peers in the same industry. Also, targeted firms in which the proposal was approved experienced decreases in both level of CEO compensation and relative use of ESO in CEO compensation.

Our study contributes to the accounting literature that relates shareholder behavior to accounting choices. We provide novel evidence of a direct mechanism, shareholder proposals, through which shareholders not only expressed their preference for an accounting method, but also seemed to successfully pressure firms to adopt this method, with spillover effects on non-targeted firms. Other accounting issues with social policy implications (e.g., accounting for pensions) might meet SEC requirements and become the subject of future shareholder proposals.

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[32] Because our tests focus on measures of realized compensation, they do not capture other important changes in compensation practices. For example, among the targeted firms, Intel decided to voluntarily submit its new stock option plan to shareholder approval every year (*Wall Street Journal* 2004) and Siebel Systems shifted to performance-based stock options (*Wall Street Journal* 2005). These changes might have been prompted, in part, by the ESO expensing proposals and ensuing debate.

Our research also contributes to the literature on CEO pay. Unlike compensation-related shareholder proposals in the 1990s, we find that ESO expensing proposals often received significant voting support and, in these cases, were associated with subsequent changes in the level and composition of CEO pay. Our evidence calls for more research on the effectiveness of shareholder activism on CEO pay in the post-Enron period, characterized by closer scrutiny of CEO pay and new types of compensation-related shareholder proposals.

Finally, our work contributes to the growing literature on shareholder activism. Our evidence indicates greater influence of shareholder proposals on corporate decisions in the post-SOX environment, and highlights the need to account for spillover effects on non-targeted firms. Also, it suggests the possibility of a broader effect on the standard-setting process. Shareholder proposals became a way to formalize investors' support for ESO expensing. In fact, SFAS No. 123R explicitly refers to "numerous nonbinding shareholder resolutions" to expense ESO (SFAS No. 123R, Appendix B, para. B26). Besides, by accelerating the rate of adoption of ESO expensing, these proposals affected the degree of comparability between voluntary adopters and other firms, one of the concerns leading to the issuance of the new standard (SFAS No. 123R, Summary, para. B). In this respect, the ESO expensing initiative exemplifies the emerging role of shareholder proposals as a lobbying mechanism for influencing regulatory reform.[33] Our study might spur more research in this direction.

APPENDIX A
THE "PATH" TOWARD EMPLOYEE STOCK OPTION (ESO) EXPENSING

- October 1995: SFAS No. 123
  - FASB releases SFAS No. 123, allowing firms to choose between the fair value-based method and intrinsic value-based method of ESO accounting.
- August 2001: IASB discussion paper
  - IASB calls for comment on a discussion paper advocating ESO expensing.
- February 2002–September 2002: support for ESO expensing builds
  - Four Senators present a tax bill that would prohibit companies from deducting the cost of ESO from taxable income unless recognized as an expense (February).
  - In Standard & Poor's new Core Earnings measure, ESO are expensed (May).
  - Coca-Cola announces that it will begin expensing ESO (July).
  - TIAA-CREF and Council of Institutional Investors lobby firms to expense ESO (July).
  - Warren Buffett and Alan Greenspan advocate ESO expensing (July–August).
  - The Conference Board endorses ESO expensing (September).
- September 2002–April 2003: regulators take action in favor of ESO expensing
  - Securities and Exchange Commission (SEC)
    - Former SEC Chair H. Pitt states that shareholders should be given the opportunity to vote on whether to expense ESO (September 2002).

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[33] Two recent examples of union pension funds' initiatives also directed at influencing policy makers are the shareholder proposals asking firms to adopt a majority voting system for the election of directors (Sjostrom and Sang Kim 2007) and the shareholder proposals requesting that firms adopt an advisory vote on executive compensation reports (Ferri and Maber 2008).

    - Reversing its prior position, the SEC allows shareholder proposals for ESO expensing to be voted on at annual meetings (December 2002).
  - Financial Accounting Standards Board (FASB)
    - FASB releases an invitation to comment on the IASB Exposure Draft on accounting for share-based payment (November 2002).
    - Accounting for stock-based compensation is put on the agenda (March 2003).
    - FASB determines that ESO should be expensed at fair value (April 2003).
- February 2003–June 2003: support for ESO expensing grows
  - Major accounting firms (E&Y, PWC) support ESO expensing (February–April 2003).
  - Sixty-nine shareholder proposals requesting ESO expensing are voted on, 30 of which receive a majority vote (April–June 2003).
  - By June 2003, ~300 U.S. firms have voluntarily adopted ESO expensing.
- March 2003–December 2003: anti-expensing lobby takes initiative
  - A bill introduced in Congress (H.R. 1372) would impose a three-year moratorium on any new related FASB rule (March 2003).
  - Seven thousand comment letters (1,800 from Cisco employees) are sent to FASB.
  - Senator Enzi (R-Wyo.) introduces a bill that would limit expensing to ESO granted to top five executives and exempt newly public firms for three years. A similar bill introduced by Senator Baker (R-La) would also postpone FASB's release of a new rule (November).
- February 2004–December 2004: standard setters mandate ESO expensing
  - IASB issues a new standard (IFRS 2) mandating ESO expensing (February).
  - FASB issues an Exposure Draft requiring ESO expensing at grant date (March).
  - FASB releases SFAS No. 123R mandating ESO expensing at the grant date (December). By this time, ~800 U.S. firms have adopted ESO expensing.

APPENDIX B
EXCERPTS OF PROPONENTS' ARGUMENTS FOR ESO EXPENSING PROPOSALS

Intel Corp, Proxy Statement, 04/02/2003

The lack of option expensing can promote excessive use of options in a company's compensation plans, obscure and understate the cost of executive compensation, and promote the pursuit of corporate strategies designed to promote short-term stock price rather than long-term corporate value.

A recent report issued by Standard & Poor's (2002) indicated that the expensing of stock option grant costs would have lowered operational earnings at companies by as much as 10 percent. "The failure to expense stock option grants has introduced a significant distortion in reported earnings," stated Federal Reserve Board Chairman Alan Greenspan. "Reporting stock options as expenses is a sensible and positive step toward a clearer and more precise accounting of a company's worth" (*Globe and Mail,* "Expensing Options is a Bandwagon Worth Joining," Aug. 16, 2002).

Warren Buffett wrote in a *New York Times* op-ed piece on July 24, 2002:

> There is a crisis of confidence today about corporate earnings reports and the credibility of chief executives. And it's justified. [...] I am referring to the legal, but improper, accounting methods used by chief executives to inflate reported earnings. Options are a huge cost for many corporations and a huge benefit to executives. [...] When a

company gives something of value to its employees in return for their services, it is clearly a compensation expense. And if expenses do not belong in the earnings statement, where in the world do they belong?

Many companies have responded to investors' concerns about their failure to expense stock options. In recent months, more than 100 companies, including such prominent ones as Coca-Cola, *Washington Post*, and General Electric have decided to expense stock options in order to provide their shareholders more accurate financial statements. Our Company has yet to act. We urge your support.

Cintas Corp, Excerpt from Proxy Statement, 09/09/2003

... Standard & Poor's recently began calculating a "core earnings" number in which the cost of options is treated as an expense ...

... We believe that voluntarily expensing stock options sends a signal to the market that a company is committed to transparency and corporate governance best practices.

... Expensing fixed stock option awards will also eliminate a disincentive to award indexed options, which tie compensation more closely to company rather than market or industry performance and which must be expensed. The Conference Board's Commission on Public Trust and Private Enterprise recently recommended that companies be required to expense fixed option awards in order to level the playing field among forms of equity-based compensation ...

Delta Airlines, Excerpt from Proxy Statement, 03/25/2003

Stock options comprise an important part of Delta's executive compensation. From CEO Leo Mullin's hiring in August 1997 through the end of 2001, he was granted options to buy 1,693,200 shares of Delta stock, with an aggregate estimated value of $45,918,859.

... not expensing stock options may lead to abuse by companies that see them as "free money." As Standard & Poor's put it in its recent report, "when something is significantly underpriced, it is often also substantially overconsumed." I believe this concern is relevant to Delta, since Institutional Shareholder Services, the largest proxy advisory service, has calculated that the total potential voting power dilution of Delta's equity compensation plan stands at 32.45 percent ...

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Tax Reporting Aggressiveness and Its Relation to Aggressive Financial Reporting

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ABSTRACT: We investigate the association between aggressive tax and financial reporting and find a strong, positive relation. Our results suggest that insufficient costs exist to offset financial and tax reporting incentives, such that nonconformity between financial accounting standards and tax law allows firms to manage book income upward and taxable income downward in the same reporting period. To examine the relation between these aggressive reporting behaviors, we develop a measure of tax reporting aggressiveness that statistically detects tax shelter activity at least as well as, and often better than, other measures. In supplemental stock returns analyses, we confirm that the market overprices financial reporting aggressiveness. We also find that the market overprices tax reporting aggressiveness, but only for firms with the most aggressive financial reporting.

Keywords: *tax reporting aggressiveness; tax shelters; book-tax differences; financial reporting aggressiveness; earnings management; discretionary accruals.*

Data Availability: *Data are available from public sources as indicated in the text.*

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I. INTRODUCTION

Since the revelations of accounting fraud and aggressive tax sheltering at Enron in 2001, regulators, academics, and journalists alike have investigated reports of increasing financial and tax reporting aggressiveness across corporate America. While the Securities and Exchange Commission (SEC) has focused its attention on hundreds of accounting restatements as well as numerous cases of accounting fraud (General Accounting Office [GAO] 2002, 2006), the Treasury Department has aggressively pursued the detection and prosecution of pervasive tax shelter activity (U.S. Department of the Treasury 1999, 2004; McKinnon 2004). At the same time, journalists have placed a spotlight on companies reporting financial statement income that is substantially higher than the income reported to tax authorities (Murray 2002; Gross 2003; Browning 2004; Drucker 2006). Our study builds on such anecdotal evidence and investigates the relation (if any) between aggressive financial and tax reporting.

Prior research explores the trade-offs managers face when making financial and tax reporting decisions (see Shackelford and Shevlin [2001] for a review). In particular, managers trying to boost financial reporting income may incur tax costs to report higher book income. Similarly, managers trying to minimize income reported to tax authorities may report lower income to shareholders and thereby incur financial reporting costs. Studies that examine these book-tax trade-offs either assume extensive conformity between financial and tax accounting rules or examine areas of accounting where conformity compels firms to decide which measure of income is more important to manage, sacrificing management efforts related to the other.

In contrast, recent trends highlight that firms do not always trade-off financial and tax reporting decisions, and in fact some firms may be reporting higher book income to shareholders *and* lower taxable income to tax authorities. Since the early 1990s, U.S. corporations have reported increasing differences between the income reported to shareholders and the income reported to the Federal government (Desai 2002; Manzon and Plesko 2002; Mills et al. 2002; Boynton et al. 2005; Hanlon et al. 2005). This growing gap between financial and taxable income suggests that firms may not always trade-off financial and tax reporting decisions. Instead, areas of nonconformity between financial accounting and tax rules offer firms the opportunity to manage book income upward *and* taxable income downward in the same reporting period. Our research, motivated by the recent accounting scandals, aggressive tax shelter activity, and the growing book-tax gap, investigates the relation between financial and tax reporting aggressiveness within a broad sample of firms.

Conceptually, we define aggressive financial reporting as upward earnings management that may or may not be within the confines of generally accepted accounting principles (GAAP) and aggressive tax reporting as downward manipulation of taxable income through tax planning that may or may not be considered fraudulent tax evasion. Thus, our definitions of aggressive reporting imply fraudulent reporting as well as uncertain reporting positions.[1] From an empirical standpoint, we consider firms to have aggressive financial (tax) reporting if they have high discretionary *pre-tax* accruals (permanent book-tax differences). While our measure of aggressive financial reporting has been widely used in accounting research, we develop our own measure of aggressive tax reporting. We develop our own proxy for tax aggressiveness due to the limitations of other proxies used in the literature for addressing our research question, including average effective tax rates, total book-tax differences, and discretionary total book-tax differences (as computed by Desai and Dharmapala 2006).

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[1] While aggressive financial reporting has been thoroughly explored in the accounting literature, aggressive tax reporting has been investigated to a lesser degree. We characterize tax reporting aggressiveness as reflecting a broad range of activities (e.g., transfer pricing arrangements, location of intangible property in low-tax locations, utilization of flow-through entities in structured transactions, synthetic lease arrangements, and tax shelter transactions). Not all of these transactions would be deemed inappropriate by the IRS, but all reflect some degree of tax reporting aggressiveness, especially the more a firm utilizes them.

We first validate our measure of tax reporting aggressiveness (*DTAX*) by linking it to a sample of firms identified by Graham and Tucker (2006) as engaging in tax shelter activity. The results indicate that our measure is a significant predictor of tax shelter activity. Moreover, compared to other measures of tax reporting aggressiveness, our measure is at least as good as total book-tax differences, and statistically better than effective tax rates and the tax shelter measure computed by Desai and Dharmapala (2006) in predicting tax shelter activity.

After establishing the external validity of our measure of tax reporting aggressiveness, we perform several empirical analyses to examine the relation between financial and tax reporting aggressiveness. First, using performance-matched modified-Jones model discretionary accruals (*DFIN*) as a measure of financial reporting aggressiveness, we find that our proxies for aggressive financial and tax reporting are consistently, significantly, and positively related and that more firms report similar levels of financial and tax reporting aggressiveness than predicted by random probability. Second, in regressions of tax reporting aggressiveness on financial reporting aggressiveness (and *vice versa*), we find a strong positive relation between these two constructs, even after controlling for tax planning and earnings management incentives and other firm-specific characteristics. We conclude that financial and tax reporting aggressiveness are significantly, positively related—a result that is unaffected by numerous robustness tests.

Last, we examine the implications of aggressive financial and tax reporting for future stock returns. Similar to Sloan (1996) and Xie (2001), we rank firm-years based on our measures of financial and tax reporting aggressiveness and find that the market generally overprices aggressive financial reporting, consistent with prior research. We also find that the market overprices aggressive tax reporting positions for firms with the most aggressive financial reporting. Multivariate regressions that control for other factors that affect stock returns confirm the univariate results. Although our returns tests are exploratory in nature, our results suggest that the market generally impounds the information in tax reporting aggressiveness in a timely manner, except for firms with the most aggressive financial reporting.

Understanding the extent to which financial and tax reporting aggressiveness are positively related is important to several parties. To the extent that nonconformity between GAAP and tax law allows tax planning by firms that manage earnings, the Internal Revenue Service (IRS) incurs additional costs to prevent the loss of tax revenue. To the extent that nonconformity allows earnings management by firms that aggressively tax plan, the SEC incurs additional costs to ensure the quality of earnings. Thus, our research provides insights relevant to the debate regarding book-tax conformity. In particular, requiring more book-tax conformity would likely reduce the "numbers games" played by corporations with respect to both financial and taxable incomes (Carnahan and Novack 2002).

Our research is also important for investors, who presumably evaluate the quality of earnings and the extent of tax reporting aggressiveness when making investment decisions. If investors are aware that a particular firm engaged in aggressive financial (tax) reporting, then they should also investigate whether the firm engaged in aggressive tax (financial) reporting.

Last, our study contributes to the accounting literature in at least three dimensions. First, our study documents a strong, positive relation between financial and tax reporting aggressiveness, a relatively unexplored area of accounting research. Future research should focus on why financial and tax reporting aggressiveness are positively related and explore the characteristics associated with aggressive corporate reporting. Second, our study develops a measure of tax reporting aggressiveness that statistically detects tax shelter activity at least as well as, and often better than, other measures of tax reporting aggressiveness. Finally, our study is the first to examine the dual impact of financial and tax reporting aggressiveness on future stock returns.

Section II reviews prior research and develops our hypothesis. Section III develops our measure of tax reporting aggressiveness and links it to tax shelter activity. Section IV investigates the relation between financial and tax reporting aggressiveness and the implications of aggressive reporting for future stock returns, while Section V concludes.

II. PRIOR RESEARCH AND HYPOTHESIS DEVELOPMENT

Anecdotal evidence suggests that financial and tax reporting aggressiveness increased from the mid-1990s to the early 2000s. During this time period, numerous companies were investigated and/or prosecuted for fraudulent accounting practices and abusive tax shelter transactions. The IRS and academic researchers also document a growing gap between financial and taxable incomes during this same time period. For example, Boynton et al. (2005) show that total book-tax differences taken from corporate U.S. tax returns increased from $43 billion in 1993 to $313 billion in 1999, and that after dipping to ($49) billion in 2001, the book-tax gap surged back to $436 billion in 2003. Thus, evidence suggests that companies were engaging in increasingly aggressive reporting practices during this time period.

Consistent with the growing book-tax gap, research suggests that the substantial discretion available in GAAP provides managers the opportunity to manage their book earnings upward without affecting their taxable income (Phillips et al. 2003; Hanlon 2005; among others). Moreover, articles suggest that the most advantageous type of tax planning, i.e., tax planning that creates a permanent wedge between financial and taxable incomes, was common in the latter half of the 1990s (U.S. Congress Joint Committee on Taxation 1999; Weisbach 2002; McGill and Outslay 2004). Combining evidence of a firm's ability to manage book income upward (without impacting taxable income) with their ability to manage taxable income downward (without impacting book income) suggests that firms have the opportunity to engage in aggressive financial and tax reporting behaviors in the same reporting period.

In contrast, prior research documents that firms frequently face trade-offs in their financial and tax reporting decisions. In these studies, firms generally report either higher financial income to shareholders or lower taxable income to tax authorities because conformity between GAAP and tax law compels firms to decide which measure of income is more important to manage (see Shackelford and Shevlin [2001] for a review).[2]

The contrasting evidence discussed above highlights that a firm's ability to engage in aggressive financial *and* tax reporting behaviors depends, in part, on the extent of book-tax conformity to which they are subject. To the extent that a particular firm operates in an environment that allows substantial discretion in its financial and tax accounting decisions, the firm could have a greater ability to be aggressive for both financial and tax reporting purposes.

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[2] Scholes et al. (1990) conclude that banks are willing to pay substantial income taxes related to gains from sales of securities in order to boost their book income and regulatory capital, consistent with financial reporting incentives dominating tax reporting incentives with respect to choices made by regulated industries. On the other hand, Guenther et al. (1997) find that a sample of firms that experienced an increase in book-tax conformity after the Tax Reform Act of 1986 deferred income recognition, thereby incurring financial reporting costs to avoid explicit tax costs. Other studies examining trade-offs between financial and tax reporting decisions include Johnson and Dhaliwal (1988), Matsunaga et al. (1992), Guenther (1994), Hunt et al. (1996), Jenkins and Pincus (1998), (Maydew 1997), and Engel et al. (1999). See Shackelford and Shevlin (2001) for a thorough review of the trade-off literature.

However, even if firms have the ability to be aggressive for both financial and tax reporting purposes, it is not obvious that firms would be *willing* to engage in both behaviors. Prior research argues that firms with large book-tax differences are subject to greater scrutiny from regulators (e.g., Cloyd 1995; Mills 1998; Badertscher et al. 2009) and external auditors (e.g., Hanlon and Krishnan 2006). Thus, firms may avoid being aggressive for both financial and tax reporting purposes to avoid greater regulatory scrutiny.

So despite the recent flurry of accounting scandals and tax shelter activities, which were accompanied by an increasing gap between financial and taxable incomes, it is not necessarily true that firms with aggressive financial reporting are the same firms as those with aggressive tax reporting. It is altogether possible that different sets of firms engage in aggressive financial and tax reporting behaviors, respectively. Nonetheless, we state our hypothesis in the alternative:

> **H1:** Financial reporting aggressiveness is positively related to tax reporting aggressiveness.

III. MEASURING TAX REPORTING AGGRESSIVENESS

Development of *DTAX* Measure

Much prior research relies on total effective tax rates (ETRs) to measure corporate tax planning effectiveness (e.g., Stickney and McGee 1982; Gupta and Newberry 1992, 1997; Callihan 1994; Mills et al. 1998; Yin 2003). Total ETRs are generally computed as the ratio of total income tax expense to pre-tax book income and reflect permanent book-tax differences and other statutory adjustments (hereafter, permanent differences) included in the rate reconciliation schedule of a firm's income tax footnote. More recently, research has relied on alternative measures of tax reporting aggressiveness, including total book-tax differences (Wilson 2008), cash ETRs (Dyreng et al. 2008), and discretionary total book-tax differences (Desai and Dharmapala 2006).[3] We build on the ETR and discretionary accrual literatures and estimate discretionary permanent differences as our measure of tax reporting aggressiveness.[4]

We rely on a measure based on permanent differences, rather than total or temporary book-tax differences, for several reasons. First, prior research has shown that temporary book-tax differences reflect earnings management via *pre-tax* accruals (e.g., Phillips et al. 2003; Hanlon 2005). As a result, measures of tax aggressiveness that include temporary differences (i.e., total book-tax differences) can be spuriously correlated with our proxy for financial reporting aggressiveness because the relation is driven by *pre-tax* accrual earnings management and not tax planning.[5] Second, firms that manage pre-tax earnings upward will have relatively lower cash ETRs, making cash ETRs computed over short horizons spuriously correlated with our proxy for financial reporting aggressiveness. Third, because permanent differences are stated in dollar terms while ETRs are stated in percentage terms, permanent differences are more comparable to total accruals, which we use to derive our proxy for financial reporting aggressiveness.[6] Fourth, relying on permanent, rather than total, differences to measure tax reporting aggressiveness is more consistent with anecdotal evidence regarding the nature of aggressive tax shelter activity. For example, the U.S. Congress Joint Committee on Taxation (1999), Weisbach (2002), and Shevlin (2002) describe the ideal tax shelter as creating permanent, rather than temporary, book-tax differences.

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[3] Dyreng et al. (2008) discuss how their measure reflects tax *avoidance* rather than tax *aggressiveness*, where tax avoidance includes a broad array of activities that would not be considered tax aggressive, including firm and industry characteristics. Their measure is a *long-term* cash ETR, which uses cash taxes paid and pre-tax income over a multi-year period. Cash taxes paid avoids the problems associated with using current tax expense as a measure of corporate tax burden, and the multi-year period smoothes out estimated tax payments and pretax accrual management. *Long-term* cash ETRs are appropriate for their objective. However, cash ETRs, especially over short horizons, are not appropriate for our study and other studies examining tax aggressiveness. To compute their measure of tax aggressiveness, Desai and Dharmapala (2006) utilize the residuals from regressions, which estimate the effect of total accruals and firm fixed-effects on total book-tax differences.

[4] McGill and Outslay (2002) and Hanlon (2003) describe sources of measurement error when estimating taxable income based on financial statement data. We control for nontax planning items to reduce measurement error in our measure of discretionary permanent differences wherever possible.

Consistent with anecdotal evidence regarding the nature of tax shelter activity, Wilson (2009) illustrates that most of the tax shelters in his study and Graham and Tucker (2006) generate permanent book-tax differences. Specifically, Wilson (2009) finds that five of eight tax shelters generate permanent differences. The three tax shelters that generate temporary differences constitute only 13 of 52 transactions in his study.[7] Thus, Wilson (2009) provides evidence that tax sheltering generates more permanent than temporary book-tax differences. The Appendix illustrates how the transfer-pricing tax shelter included in Graham and Tucker (2006) and Wilson (2009) impacts our calculation of permanent differences, which we denote *PERMDIFF*. In summary, we acknowledge that our measure excludes tax planning that generates temporary differences, but we believe the benefit of excluding the spurious correlation between temporary differences and pre-tax earnings management outweighs the costs of excluding this type of tax planning.

Last, total book-tax differences, cash ETRs, and the Desai and Dharmapala (2006) (hereafter, DD) measure do not control for nondiscretionary items (e.g., intangible assets and property, plant, and equipment) that cause temporary and/or permanent book-tax differences.[8] The DD measure does explicitly control for earnings management by including total accruals, but this control would potentially eliminate any relation between financial and tax reporting aggressiveness, including the relation we are investigating.

Although permanent differences exhibit many advantages over other proxies of tax reporting aggressiveness, permanent differences reflect items that are not considered aggressive tax reporting, including state income taxes, tax credits, changes in tax cushion (i.e., tax contingencies), and changes in the valuation allowance account. Thus, we estimate discretionary permanent differences (*DTAX*), our measure of tax reporting aggressiveness, by regressing total permanent differences on nondiscretionary items that are known to cause permanent differences (e.g., intangible assets) and other statutory adjustments (e.g., state taxes) but are likely unrelated to tax reporting aggressiveness. Specifically, we estimate

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[5] Aggressive tax planning, which generates permanent tax savings, boosts net income but not *pre-tax* discretionary accruals *(DFIN)*, which is consistent with our hypothesis. However, it is possible that our conclusions of the positive relation between tax and financial reporting aggressiveness may not generalize to tax planning through deferral (i.e., temporary differences).

[6] Because we deflate our measure by total assets at $t-1$, we also avoid the small denominator problem that plagues ETR measures deflated by pre-tax income.

[7] Of the 13 transactions that generated temporary differences, all of the LILO and half of the 401(k) tax shelter transactions were implemented by firms in SIC codes 6000–6999 or 4900–4999, which we eliminate because of their regulatory environment. In the end, 83 percent of the tax shelters implemented by nonfinancial or non-utility firms in the Wilson (2008) sample generated permanent differences.

[8] Desai and Dharmapala (2006) include firm-fixed effects, so they have controlled for nondiscretionary items which are consistent across time for a firm.

Equation (1) below by two-digit SIC code and fiscal year, where all variables (including the intercept α_0) are scaled by beginning-of-year total assets (Compustat #6). We use the residuals (ε) from Equation (1) as our estimates of discretionary permanent differences (i.e., *DTAX*).

$$PERMDIFF_{it} = \alpha_0 + \alpha_1 INTANG_{it} + \alpha_2 UNCON_{it} + \alpha_3 MI_{it} + \alpha_4 CSTE_{it} + \alpha_5 \Delta NOL_{it} + \alpha_6 LAGPERM_{it} + \varepsilon_{it} \tag{1}$$

where:

$PERMDIFF_{it}$ = total book-tax differences less temporary book-tax differences for firm i in year t = $\{BI_{it} - [(CFTE_{it} + CFOR_{it})/STR_{it}]\} - (DTE_{it}/STR_{it})$;
BI_{it} = pre-tax book income (#170) for firm i in year t;
$CFTE_{it}$ = current federal tax expense (#63) for firm i in year t;
$CFOR_{it}$ = current foreign tax expense (#64) for firm i in year t;
DTE_{it} = deferred tax expense (#50) for firm i in year t;
STR_t = statutory tax rate in year t;
$INTANG_{it}$ = goodwill and other intangibles (#33) for firm i in year t;
$UNCON_{it}$ = income (loss) reported under the equity method (#55) for firm i in year t;
MI_{it} = income (loss) attributable to minority interest (#49) for firm i in year t;
$CSTE_{it}$ = current state income tax expense (#173) for firm i in year t;
ΔNOL_{it} = change in net operating loss carryforwards (#52) for firm i in year t;
$LAGPERM_{it}$ = one-year lagged *PERMDIFF* for firm i in year t; and
ε_{it} = discretionary permanent difference ($DTAX_{it}$) for firm i in year t.[9]

We include variables to control for nondiscretionary permanent differences unrelated to tax planning. Specifically, we control for goodwill and other intangible assets (*INTANG*) because differences between the financial and tax accounting rules for goodwill and other intangibles frequently create permanent differences unrelated to tax planning.[10] We also control for income or loss attributable to the equity method (*UNCON*) and to minority interests (*MI*) due to differences between the financial accounting and tax rules regarding equity interests in less than 100-percent-owned entities.

We control for current state tax expense (*CSTE*) because while our measure of book income is not reduced by current state tax expense, our measure of taxable income is reduced by such expense, resulting in nondiscretionary permanent differences. We control for changes in net operating loss carryforwards (ΔNOL) because prior literature documents that changes in net operating loss carryforwards are often associated with changes in the valuation allowance account, which flow through the statutory reconciliation schedule (and thus affect our *PERMDIFF* measure) but are typically unrelated to tax planning (e.g., Miller and Skinner 1998; Schrand and Wong 2003; Frank and Rego 2006). Finally, we include the lagged value of permanent book-tax differences (*LAGPERM*) to control for nondiscretionary permanent differences that persist through time (e.g., municipal bond interest, tax credits), which are less likely to reflect current aggressive tax planning.[11,12]

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[9] If minority interest (#49), current foreign tax expense (#64), income from unconsolidated entities (#55), or current state tax expense (#173) is missing on Compustat, then we set *MI*, *CFOR*, *UNCON*, or *CSTE*, respectively, to zero. If current federal tax expense (#63) is missing on Compustat, then we set the value of *CFTE* to: total tax expense (#16) less current foreign tax expense (#64) less current state tax expense (#173) less deferred tax expense (#50). If goodwill and other intangibles (#33) is missing on Compustat, then we set the value for *INTANG* to 0. If #33 = C, then we set the value of *INTANG* to that for goodwill (#204).

[10] Goodwill created prior to 1993 is not tax-deductible, but generates amortization expense for financial accounting purposes under the purchase method of accounting. Since 1993, firms typically do not amortize goodwill for tax purposes. In contrast, firms continued to amortize goodwill for financial accounting purposes until January 1, 2002, when SAS No. 142 eliminated the amortization of goodwill.

Validating Our Measure of Tax Reporting Aggressiveness

We compute our proxy for tax reporting aggressiveness, *DTAX*, by controlling for nondiscretionary items unrelated to tax planning that cause permanent differences and other statutory adjustments. To provide external validity for our measure, we link it to a sample of firms identified by Graham and Tucker (2006) as engaging in tax shelter transactions. Graham and Tucker (2006) summarize their sample selection process as focusing on firms that the government has accused of tax sheltering. In particular, they collect a sample of firms involved in tax shelter cases against the U.S. government or that were served by the IRS with a Notice of Deficiency related to an alleged tax shelter. Table 1, Panel A summarizes the selection procedures we followed to utilize Graham and Tucker's (2006) sample of tax shelter firms.

Specifically, we obtain a sample of 155 firm-years (43 firms) that engaged in tax shelter activity from Graham and Tucker (2006, Table 1, 568). After eliminating 31 firm-years (10 firms) that are missing data necessary for this analysis, 9 firm-years (2 firms) in the financial services and utilities industries, and 3 firm-years (1 firm) that are a subsidiary of another company, our sample of tax shelter firms is reduced to 112 firm-years (30 firms).[13] We then create a control sample following Graham and Tucker's matching criteria.[14] First, we match each tax shelter firm-year to other firm-years that:

1. have the same two-digit SIC and year as the tax shelter firm-year,
2. have total assets at year $t-1$ within 25 percent of the tax shelter firm-year,
3. have pre-tax return on assets at year $t-1$ within 50 percent of the tax shelter firm-year, and
4. do not appear in the tax shelter sample in any year.

We lose another 34 tax shelter firm-years (five firms) because the shelter firm-year lacks a matched control firm-year with sufficient data to compute *DTAX*. At this point, our sample consists of 78 tax-shelter firm-years (25 firms) and 236 control firm-years. For each tax shelter firm-year with multiple matches, we collapse those multiple matches into a single

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[11] If firms are consistently aggressive in their tax reporting, then controlling for lagged *PERMDIFF* excludes some tax shelter activity from our measure of tax aggressiveness. However, this exclusion biases against finding results and properly excludes recurring items such as municipal bond interest and tax credits that do not necessarily reflect aggressive tax planning activities.

[12] We do not include a control for changes in tax cushion in Equation (1). Instead, we compute our measure of financial reporting aggressiveness on a pre-tax basis, to avoid any potential spurious correlation between our measures of financial and tax reporting aggressiveness, which would exist if a firm managed its book income upward by reducing its tax contingency. Thus, *DTAX* still reflects changes in tax cushion, but such changes should not be systematically related to *DFIN*. In Section IV robustness tests, we control for changes in a firm's tax cushion, and the relation between *DFIN* and *DTAX* is unaffected.

[13] We compute *DTAX* in the same manner as described earlier in the study, except we estimate *DTAX* for years prior to 1991 to capture the Graham and Tucker (2006) sample that ranges from 1977 to 2000.

[14] This procedure is similar to the procedure used in Graham and Tucker (2006) except they match based on *after-tax* return on assets. We match based on *pre-tax* return on assets to better control for a firm's incentive to engage in aggressive tax sheltering. Graham and Tucker (2006) also use a different matching criterion for three firms that did not have matches using their primary matching criteria. We use only the primary matching criteria.

TABLE 1
Sample Selection Procedures

Panel A: Sample Selection for the Tax Shelter Analysis

	Firm-Years	Firms
Total from Graham and Tucker (2006)	155	43
Less:		
Not available on Compustat	10	4
Data not available on total assets	4	0
Data not available to estimate *DTAX*	17	6
Utilities and financial services firms	9	2
Subsidiary of another company	3	1
Subtotal	112	30
Data not available for a matched control firm-year	34	5
Total observations	78	25

Panel B: Sample Selection for the Association Analyses

	Firm-Years	Firms
All observations available on Compustat from 1991–2005	142,374	18,316
Less:		
Subsidiary of another company	3,674	429
Foreign incorporation	15,365	1,930
Book value of equity is not positive	15,144	910
Utilities and financial services firms	26,260	3,632
Subtotal	81,931	11,415
Data not available to estimate *DFIN*	23,328	2,448
Data not available to estimate *DTAX*	8,717	867
Total observations	49,886	8,100

matched firm-year observation by computing average values across all matched control firm-years (i.e., 78 tax shelter and 78 control firm-years).[15]

Using our tax shelter and control samples, we estimate a logit regression where the dependent variable is an indicator variable, *TS*, that equals 1 if a firm is identified as having tax shelter activity, and 0 otherwise. We include our measure of tax reporting aggressiveness, *DTAX*, as an independent variable, along with other variables that have been shown to be associated with tax planning activity (e.g., Rego 2003; Wilson 2009). We include leverage (*LEV*) because Graham and Tucker (2006) find these tax shelter firms have lower leverage ratios than their control sample. We also include the following variables as proxies for incentives to tax plan: profitability (*PTROA*), the presence of net operating loss carryforwards (*NOL_D*), the existence of foreign operations (*FOR_D*), and firm size (*SIZE*).

$$TS_{it} = \beta_0 + \beta_1 DTAX_{it} + \beta_2 LEV_{it} + \beta_3 PTROA_{it} + \beta_4 NOL\_D_{it} + \beta_5 FOR\_D_{it} + \beta_6 SIZE_{it} + \varepsilon_{it}. \qquad (2)$$

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[15] Because our tax shelter sample includes multiple observations for some firms, we estimate Equation (2) with robust standard errors that correct for any potential autocorrelation.

We calculate the control variables in Equation (2) as follows:

LEV_{it} = total debt (Compustat #9 + #34) for firm i at year t, divided by total assets (#6) at year t;
$PTROA_{it}$ = pre-tax income (#170) for firm i at year t, divided by total assets (#6) at year $t-1$;
NOL_D_{it} = 1 if the NOL carryforwards for firm i at year $t-1$ (#52) are greater than 0, and 0 otherwise;
FOR_D_{it} = 1 if foreign income (#273) for firm i in year t is not equal to 0, and 0 otherwise; and
$SIZE_{it}$ = natural log of total assets (#6) for firm i at year t.

We examine the sign and significance of the coefficient on *DTAX* to assess its ability to explain tax shelter activity.

In addition, we estimate the same logit regression with other measures of tax reporting aggressiveness and compare their ability to explain tax shelter activity to our *DTAX* measure's ability. Those alternative measures include: (1) total book-tax differences (*BTD*), (2) total effective tax rates (*ETR*), and (3) tax reporting aggressiveness as computed by Desai and Dharmapala (2006) (*DD*).[16] We compute total book-tax differences (*BTD*) as pre-tax book income (Compustat #170) less estimated taxable income [(#63 + #64)/U.S. statutory tax rate] at year t, divided by total assets at year $t-1$ (#6); *ETR* is the ratio of total tax expense (#16) to pre-tax income (#170) at year t; and *DD* are residuals from a pooled, cross-sectional regression of total book-tax differences on total accruals at year t and firm fixed effects.

As discussed in the prior section, *DTAX* has several advantages over these alternative measures, including the exclusion of temporary differences that can reflect earnings management activity and controls for nondiscretionary sources of permanent book-tax differences (e.g., intangible assets). On the other hand, it does not reflect tax shelter activity that generates temporary differences, such as lease-in-lease-out (LILO) arrangements. Nonetheless, if firms rely on a variety of tax shelter strategies that generate both temporary and permanent differences (i.e., if such strategies are positively related), then the coefficient on *DTAX* in Equation (2) should be positive and significant.

Table 2 reports the results of estimating Equation (2) with each measure of tax reporting aggressiveness. In the regression with *DTAX*, the coefficient on *DTAX* is positive and significant (p-value = 0.00). The marginal effect of a 1 percent increase in *DTAX* is a 6.4 percent higher probability of tax shelter activity. This result provides evidence that *DTAX* effectively captures tax shelter activity, as reflected in a sample of firms identified in Graham and Tucker (2006) as having engaged in tax shelter transactions. Consistent with Graham and Tucker (2006), we also find a negative coefficient on *LEV*, consistent with leverage and tax shelter activity serving as substitutes. Among the other variables, *PTROA* and *SIZE* are positive and significant as expected, while the two indicator variables are insignificant.

In the regressions that include other measures of tax aggressiveness, the coefficient on total book-tax differences (*BTD*) is positive and significant (p-value < 0.01), consistent with that measure also explaining tax shelter activity. The marginal effect of a 1 percent

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[16] We do not include long-term cash ETRs (as computed by Dyreng et al. [2008]) in our analysis due to the lack of requisite data for that measure during the time period of the Graham and Tucker (2006) tax shelter sample, which spans from 1975 to 2000, and the five-year data requirement.

TABLE 2
Logit Regressions of Tax Shelter Indicator Variable (*TS*) on Measures of Tax Reporting Aggressiveness and Control Variables during 1977–2000

$$TS_{it} = \gamma_0 + \gamma_1 TAX_{it} + \gamma_2 LEV_{it} + \gamma_3 PTROA_{it} + \gamma_4 NOL\_D_{it} + \gamma_5 FOR\_D_{it} + \gamma_6 SIZE_{it} + v_{it} \quad (2)$$

		DTAX Averaged Control Firm-Years		*BTD* Averaged Control Firm-Years		*DD* Averaged Control Firm-Years		*ETR* Averaged Control Firm-Years	
Variable	**Predicted**	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Intercept		−1.714	0.099	−1.663	0.137	−0.268	0.779	−0.598	0.512
TAX	+	25.569	0.002	9.326	0.007	−2.348	0.147	−0.973	0.262
LEV	−	−5.620	0.005	−5.865	0.001	−5.770	0.001	−5.145	0.003
PTROA	+	3.951	0.041	2.303	0.197	2.126	0.191	3.244	0.065
NOL_D	−	0.280	0.669	0.444	0.499	0.425	0.511	0.474	0.441
FOR_D	+	−0.278	0.526	−0.007	0.987	−0.099	0.831	−0.146	0.753
SIZE	?	0.306	0.015	0.295	0.022	0.272	0.044	0.199	0.085
n = 1		78		78		72[a]		78	
n = 0		78		78		72		78	
Log Pseudolikelihood		−94.768		−96.210		−91.334		−99.597	
Pseudo-R^2		0.124		0.110		0.085		0.079	
Prob > χ^2 ROC Test		NA		0.465		0.037		0.018	

(*continued on next page*)

TABLE 2 (continued)

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[a] Six of the 78 observations in our sample did not have sufficient data to estimate *DD*.

Variable Definitions (all variables are at year t unless stated otherwise):

TS = 1 if an observation is identified in Graham and Tucker (2006) as having engaged in a tax shelter activity, 0 otherwise;

TAX = *DTAX*, *BTD*, *DD* or *ETR*, indicated by column heading;

DTAX = residuals from regressions (estimated by industry and year) of permanent differences on nondiscretionary items known to cause permanent differences and other statutory adjustments that are unrelated to tax planning activities.

BTD = (pre-tax income (Compustat #170) − estimated taxable income [(Compustat #63 + Compustat #64)/U.S. statutory tax rate]) divided by total assets at year $t-1$ (Compustat #6);

DD = residuals from a pooled, cross-sectional regression of total book-tax differences on total accruals and firm fixed effects, consistent with the methodology in Desai and Dharmapala (2006);

ETR = total tax expense (Compustat #16) divided by pre-tax income except if total tax expense *and* pre-tax income are negative or missing then *ETR* is set to missing and if total tax expense is positive and pre-tax income is negative then *ETR* = 1; *ETR* is also limited to between −1 and 1;

LEV = sum of long-term debt (Compustat #9) and debt in current liabilities (Compustat #34) divided by total assets;

PTROA = pre-tax income divided by total assets at year $t-1$;

NOL_D = 1 if a firm has NOLs at year $t-1$, and 0 otherwise;

FOR_D = 1 if the absolute value of pre-tax foreign income (Compustat #273) is > 0, and 0 otherwise; and

SIZE = natural log of total assets.

Tax shelter firm-years are firm-years listed in Graham and Tucker (2006) that have *DTAX*. Match firm-years consist of all firm-years with the same two-digit SIC and have total assets at year $t-1$ within +/− 25 percent and *PTROA* at year $t-1$ (Compustat #170 at year $t-1$ divided by Compustat #6 at year $t-2$) within +/− 50 percent of tax shelter firm-years' total assets at year $t-1$ and *PTROA* at year $t-1$.

increase in *BTD* is a 2.3 percent higher probability of tax shelter activity. While the coefficient on *ETR* is negative as predicted, it is not statistically significant (p-value < 0.27). Moreover, the coefficient on *DD* is unexpectedly negative, inconsistent with that measure of tax reporting aggressiveness being able to predict tax shelter activity.

Comparing across regressions, the pseudo-R^2 is higher for the *DTAX* regression than for the regressions with other measures of tax reporting aggressiveness. The receiver operator curve (ROC) Chi-square test (Cox and Snell 1989) suggests that the ability of *DTAX* to explain tax shelter activity is at least as good as (p-value = 0.465 for test against *BTD*) if not significantly better than (p-values = 0.085 and 0.079 for tests against *DD* and *ETR*, respectively) other measures in predicting tax shelter activity. In summary, only *DTAX* and *BTD* are significant in explaining tax shelter activity at conventional levels. Thus, our remaining empirical tests rely on both *DTAX* and *BTD* as measures of tax reporting aggressiveness.

IV. THE RELATION BETWEEN FINANCIAL AND TAX REPORTING AGGRESSIVENESS

Sample Selection

Table 1, Panel B summarizes our sample selection procedure for the remainder of our empirical tests. We start with all firm-year observations from Compustat's annual industrial file for 1991 through 2005 (142,374 firm-years; 18,316 firms).[17] We eliminate observations associated with a subsidiary or foreign incorporated unit (19,039 firm-years; 2,359 firms), observations with book value of equity less than or equal to zero (15,144 firm-years; 910 firms), and observations in regulated industries such as utilities (SIC code 49) and financial services (SIC codes 60–69) (26,260 firm-years; 3,632 firms), as these firms likely face different reporting incentives and regulatory scrutiny than do other firms. With this sample (81,931 firm-years; 11,415 firms), we compute each of our measures of reporting aggressiveness; however, we lose additional observations because we lack the data necessary to compute financial reporting aggressiveness (23,328 firm-years; 2,448 firms) or tax reporting aggressiveness (8,717 firm-years; 867 firms). Our final sample consists of 49,886 firm-years (8,100 firms).

Measuring Financial Reporting Aggressiveness

We use performance-matched discretionary accruals (*DFIN*) as our proxy for financial reporting aggressiveness (Kothari et al. 2005). We calculate performance-matched discretionary accruals as follows, where our calculation of discretionary accruals is based on the modified-Jones model (Dechow et al. 1995), and our performance matching is based on Francis et al. (2003). First, we estimate Equation (3) below by two-digit SIC code and fiscal year, where all variables (including the intercept α_0) are scaled by beginning of year total assets (Compustat #6).

$$TACC_{it} = \alpha_0 + \alpha_1(\Delta REV_{it} - \Delta AR_{it}) + \alpha_2 PPE_{it} + \eta_{it} \tag{3}$$

where:

$TACC_{it}$ = total accruals = $(EBEI_{it} + TTE_{it}) - [(CFO_{it} + ITP_{it}) - EIDO_{it}]$ for firm i in year t;

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[17] Our sample period begins with 1991 because the book-tax gap began sometime in the early 1990s.

$EBEI_{it}$ = earnings before extraordinary items from the statement of cash flow (#123) for firm i in year t;
TTE_{it} = total tax expense (#16) for firm i in year t;
CFO_{it} = cash flow from operations (#308) for firm i in year t;
ITP_{it} = income taxes paid from the statement of cash flow (#317) for firm i in year t;
$EIDO_{it}$ = extraordinary items and discontinued operations from the statement of cash flow (#124) for firm i in year t;
ΔREV_{it} = change in sales (#12) for firm i from year $t-1$ to year t;
ΔAR_{it} = change in accounts receivable (#302) for firm i from year $t-1$ to year t;
PPE_{it} = gross property, plant, and equipment (#7) for firm i in year t; and
η_{it} = discretionary accruals for firm i in year t before adjusting for performance.

As in Hribar and Collins (2002), we compute total accruals using data from the statement of cash flows, except we measure total accruals on a *pre-tax* basis. Specifically, we reverse the deduction of total tax expense (*TTE*) from earnings before extraordinary items (*EBEI*), and we add back income taxes paid (*ITP*) to cash flow from operations (*CFO*), to compute total accruals (*TACC*). We make these adjustments to ensure that our proxies for financial and tax reporting aggressiveness are not spuriously correlated.[18] Next, we match each firm-year based on industry membership and by decile of current pre-tax return on assets (*PTROA*). We compute performance-adjusted discretionary accruals (*DFIN*) as the difference between each observation's discretionary accrual measure and the median discretionary accrual measure for its joint industry and *PTROA* decile, where the median excludes the observation.

Table 3, Panel A presents descriptive statistics from estimating *DFIN* by two-digit SIC code and year.[19] Panel A shows relatively high adjusted R^2 with a mean (median) adjusted R^2 of 44 (40) percent for the regressions by two-digit SIC code and year. The mean and median coefficients on both ($\Delta REV - \Delta AR$) and *PPE* are significantly different from zero (p-value < 0.01) and are consistent with those in Jones (1991). Finally, the last column presents the percentage of regressions that have positive coefficients for each independent variable.

Table 3, Panel B presents descriptive statistics from estimating *DTAX* by two-digit SIC code and year.[20] Panel B shows relatively high adjusted R^2 with a mean (median) adjusted R^2 of 62 (66) percent, consistent with the model explaining a substantial portion of the variation in *PERMDIFF*. Panel B also shows that the mean coefficients for ΔNOL and *LAGPERM* and the median coefficients for all variables are significantly different from zero.[21] The last column presents the percentage of regressions that have positive coefficients for each independent variable.

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[18] We remove income taxes from our proxy for financial reporting aggressiveness to eliminate the possibility that our proxies for financial and tax reporting aggressiveness are correlated due to any mechanical relations from the changes in the tax cushion and the valuation allowance.

[19] To calculate *DFIN* using Equation (1), we require each two-digit SIC code and year combination to have at least ten firm-year observations.

[20] Due to the greater number of independent variables in Equation (1) relative to Equation (3), we require each two-digit SIC code and year combination to have at least 15 firm-year observations to calculate *DTAX*.

[21] The large standard deviations for *UNCON*, *MI*, and *CSTE* are driven by the requirements to have 15 firms per industry-year. When we require 20 firms per industry-year, the standard deviations are substantially lower for all three variables.

TABLE 3

Descriptive Statistics for Coefficients from the Estimation of Measures of Financial Reporting Aggressiveness (*DFIN*) and Tax Reporting Aggressiveness (*DTAX*) by Two-Digit SIC Code and Fiscal Year from 1991–2005

$$TACC_{it} = \alpha_0 + \alpha_1(\Delta REV_{it} - \Delta AR_{it}) + \alpha_2 PPE_{it} + \eta_{it} \tag{3}$$

Panel A: Estimation of *DFIN*

	DFIN					
n = 871	**Mean**	**Std. Dev.**	**Q1**	**Median**	**Q3**	**> 0**
Intercept[a]	−0.35***	2.91	−0.61	−0.11***	0.16	38%
$\Delta REV - \Delta AR$	0.06***	0.42	−0.01	0.05***	0.13	70%
PPE	−0.08***	0.57	−0.11	−0.08***	−0.04	8%
Adjusted R^2	0.44***	0.30	0.20	0.40***	0.67	

$$PERMDIFF_{it} = \alpha_0 + \alpha_1 INTANG_{it} + \alpha_2 UNCON_{it} + \alpha_3 MI_{it} + \alpha_4 CSTE_{it} + \alpha_5 \Delta NOL_{it} + \alpha_6 LAGPERM_{it} + \varepsilon_{it} \tag{1}$$

Panel B: Estimation of *DTAX*

	DTAX					
n = 730	**Mean**	**Std. Dev.**	**Q1**	**Median**	**Q3**	**> 0**
Intercept[a]	−0.54***	1.96	−0.65	−0.18***	0.01	27%
INTANG	−0.65	11.34	−0.13	−0.03***	0.02	35%
UNCON	−5.04	126.68	−0.36	0.55***	1.94	66%
MI	2.13	38.61	−0.60	1.23***	3.94	68%
CSTE	3.13	72.45	0.44	1.72***	3.89	82%
ΔNOL	−0.25***	0.73	−0.47	−0.15***	0.01	28%
LAGPERM	0.30***	0.51	0.02	0.19***	0.47	84%
Adjusted R^2	0.62***	0.30	0.42	0.66***	0.88	

*** Significantly different from zero at p-value <0.01 using a two-tailed test.

[a] The intercept is divided by total assets at year $t-1$ (Compustat #6).

Variable Definitions (all variables are at year t unless stated otherwise):

TACC = total accruals = $(EBEI + TTE) - [(CFO + ITP) - EIDO]$ divided by total assets at year $t-1$;
EBEI = earnings before extraordinary items from the statement of cash flow (Compustat #123);
TTE = total tax expense (Compustat #16);
CFO = cash flow from operations (Compustat #308);
ITP = income taxes paid from the statement of cash flow (Compustat #317);
EIDO = extraordinary items and discontinued operations from the statement of cash flow (Compustat #124);
ΔREV = change in sales (Compustat #12);
ΔAR = change in accounts receivable (Compustat #302); $\Delta REV - \Delta AR$ is divided by total assets at year $t-1$;
PPE = gross property, plant, and equipment (Compustat #7) divided by total assets at year $t-1$;
PERMDIFF = total book-tax differences − temporary book-tax differences, = $[\{BI - [(CFTE + CFOR)/STR]\} - (DTE/STR)]$ divided by total assets at year $t-1$;
BI = pre-tax book income (Compustat #170);
CFTE = current federal tax expense (Compustat #63);
CFOR = current foreign tax expense (Compustat #64);
DTE = deferred tax expense (Compustat #50);
STR = statutory tax rate;
INTANG = goodwill and other intangibles (Compustat #33) divided by total assets at year $t-1$;

(*continued on next page*)

TABLE 3 (continued)

UNCON = income (loss) reported under the equity method (Compustat #55) divided by total assets at year $t-1$;
MI = income (loss) attributable to minority interest (Compustat #49) divided by total assets at year $t-1$;
CSTE = current state income tax expense (Compustat #173) divided by total assets at year $t-1$;
ΔNOL = change in net operating loss carryforwards (Compustat #52) divided by total assets at year $t-1$; and
LAGPERM = *PERMDIFF* at year $t-1$ divided by total assets at year $t-1$.

Examining the Relation between Financial and Tax Reporting Aggressiveness

We examine the relation between financial and tax reporting aggressiveness in several ways. We first compute Pearson and Spearman correlations between *DFIN* and the measure of tax reporting aggressiveness. For purposes of comparison, we include both *DTAX* and *BTD* in this analysis. However, *BTD* includes *pre-tax* accrual management because it includes temporary differences. As a result, *BTD* can be spuriously related to *DFIN*, making inferences regarding our research question difficult to interpret. We exclude *ETR* and the DD measure (*DD*) because those measures are not able to predict aggressive tax reporting in a sample of firms identified by Graham and Tucker (2006) as engaging in tax shelter activity (see Table 2).

Second, we examine the median values of tax reporting aggressiveness by quintile of *DFIN*, as well as the median values of *DFIN* by quintile of tax reporting aggressiveness. Third, we examine the frequency of firms across each quintile combination of financial and tax reporting aggressiveness. Finally, we examine the relation between financial and tax reporting aggressiveness after controlling for incentives for tax planning and earnings management.

Table 4, Panel A contains the descriptive statistics for *DFIN*, *DTAX*, and *BTD* for the entire period of our study. As expected, the mean and median values of *DTAX*, *BTD*, and *DFIN* all hover near zero (as a percentage of total assets). *DTAX* and *DFIN* should hover near zero, as they are residuals of cross-sectional regressions. Moreover, the mean and median values of *BTD* are comparable to those found in Badertscher et al. (2009) and Wilson (2009).

Table 4, Panel B shows the Pearson and Spearman correlations between our measures of financial and tax reporting aggressiveness. *DTAX* is most highly correlated with *BTD* (Pearson $\rho = 0.189$; Spearman $\rho = 0.286$; p-values <0.01). *DTAX* is also positively correlated with *DFIN* (Pearson $\rho = 0.101$; Spearman $\rho = 0.070$; p-values <0.01). The correlations between *BTD* and *DFIN* are also significantly positive, similar to those between *DTAX* and *DFIN*.

Table 5, Panel A shows the median values for our measures of tax aggressiveness (*DTAX* and *BTD*) by quintile of *DFIN*, while Panel B shows the median values of *DFIN* by quintile of tax aggressiveness. In the *DFIN* quintiles in Panel A, the median *DTAX* increases monotonically to a maximum of 0.004 in Q5. In contrast, the median values of *BTD* do not increase monotonically across the *DFIN* quintiles. Instead, the median value for *BTD* peaks in Q3.

In the *DTAX* and *BTD* quintiles reported in Table 5, Panel B, the median *DFIN* steadily increases across the *DTAX* and *BTD* quintiles. One exception occurs across the *DTAX* quintiles when the median *DFIN* dips from 0.001 in Q3 to 0.000 in Q4 before increasing

TABLE 4
Alternative Measures of Reporting Aggressiveness using Firm-Years from 1991–2005

Panel A: Descriptive Statistics

	n	Mean	Std. Dev.	Q1	Median	Q3
Tax Reporting Aggressiveness						
DTAX	49,886	0.01	0.38	−0.03	0.00	0.04
BTD	49,886	−0.02	0.23	−0.03	0.01	0.04
Financial Reporting Aggressiveness						
DFIN	49,886	0.01	.30	−0.06	0.00	0.06

Panel B: Correlations

Pearson correlations are tabulated in the lower diagonal. Spearman correlations are tabulated in the upper diagonal.

	DTAX	*BTD*	*DFIN*
DTAX		0.286***	0.070***
BTD	0.189***		0.103***
DFIN	0.101***	0.068***	

*** Significantly different from zero at p-value <0.01.

Variable Definitions:

DTAX = residuals from model (1) in Table 3, Panel B estimated by industry and year of permanent differences on nondiscretionary items known to cause permanent differences and other statutory adjustments that are unrelated to tax planning activities;

BTD = (pre-tax income (Compustat #170) − estimated taxable income [(Compustat #63 + Compustat #64)/ U.S. statutory tax rate]) divided by total assets at year $t-1$ (Compustat #6); and

DFIN = performance-matched modified Jones model discretionary accruals. The residuals from model (3) in Table 3, Panel A.

again in Q5 to 0.006. In total, Panels A and B suggest a generally positive relation between *DTAX* and *DFIN*. The positive relation between *DFIN* and *BTD* is more monotonic when sorting by *BTD* than by *DFIN*, consistent with book-tax differences also capturing nondiscretionary sources of temporary differences such as depreciation and amortization.[22]

Table 5, Panel C shows the frequencies of firm-years that fall within each quintile combination of *DTAX* and *DFIN*. As in Panels A and B above, we independently rank all firm-years based on *DTAX* and *DFIN* (where Q1 (Q5) denotes the lowest (highest) quintile) and then calculate the frequencies of firm-years in each *DTAX*/*DFIN* quintile combination. If all firm-years were randomly distributed across all quintiles of *DTAX* and *DFIN*, then we would expect to see 1,995 firm-years in each cell (i.e., 49,886/25 = 1,995). Panel C clearly shows that there are higher-than-expected frequencies of firm-years along the diagonal moving from the lowest (upper left) to the highest (lower right) quintiles of *DTAX* and *DFIN*. In contrast, many of the off-diagonal cells have fewer than expected frequencies of firm-years.[23] Panel D includes a similar frequency analysis based on quintiles of *BTD*

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[22] By construction, the greater a firm's property, plant, and equipment relative to its industry-year median, the lower *DFIN* will be. Greater property, plant, and equipment will also lead to greater temporary differences due to more accelerated depreciation.

[23] The high number of observations in the extreme off-diagonal cells may reflect firms that forgo tax reporting aggressiveness in favor of financial reporting aggressiveness (Q5 of *DFIN* and Q1 of *DTAX*), or *vice versa* (Q1 of *DFIN* and Q5 of *DTAX*).

TABLE 5
Distribution of Median Values of Financial (Tax) Reporting Aggressiveness across Quintiles of Tax (Financial) Reporting Aggressiveness using Firm-Years from 1991–2005

Panel A: Median Values of *DFIN* and *TAX* by *DFIN* Quintile

	Q1	Q2	Q3	Q4	Q5
DFIN	−0.151	−0.044	−0.001	0.043	0.156
DTAX	−0.003	0.002	0.002	0.003	0.004
BTD	−0.010	0.005	0.011	0.010	0.008

Panel B: Median Values of *TAX* and *DFIN* by *TAX* Quintile

		Q1	Q2	Q3	Q4	Q5
TAX =	*DTAX*	−0.142	−0.017	0.002	0.026	0.135
	DFIN	−0.012	−0.004	0.001	0.000	0.006
TAX =	*BTD*	−0.144	−0.020	0.006	0.029	0.091
	DFIN	−0.023	−0.008	0.001	0.005	0.010

Panel C: Distribution of Firm-Years across Each *DTAX* and *DFIN* Quintile Combination

		DTAX Quintiles					
		Q1	Q2	Q3	Q4	Q5	Total
DFIN Quintiles:	Q1	3,125	1,677	1,380	1,621	2,171	9,974
	Q2	1,570	2,270	2,228	2,196	1,715	9,979
	Q3	1,371	2,303	2,481	2,234	1,589	9,978
	Q4	1,509	2,122	2,422	2,183	1,743	9,979
	Q5	2,399	1,607	1,467	1,745	2,758	9,976
	Total	9,974	9,979	9,978	9,979	9,976	49,886

Panel D: Distribution of Firm-Years across Each *BTD* and *DFIN* Quintile Combination

		BTD Quintiles					
		Q1	Q2	Q3	Q4	Q5	Total
DFIN Quintiles:	Q1	3,435	1,879	1,424	1,349	1,887	9,974
	Q2	1,599	2,353	2,240	2,055	1,732	9,979
	Q3	1,197	2,129	2,351	2,506	1,795	9,978
	Q4	1,421	1,945	2,250	2,344	2,019	9,979
	Q5	2,322	1,673	1,713	1,725	2,543	9,976
	Total	9,974	9,979	9,978	9,979	9,976	49,886

Random probability would assign 1,995 firm-years per cell (9,977 firm-years per row/column) in Panels C and D. Quintiles are formed by year.

Variable Definitions:
DTAX = discretionary permanent differences as described in Table 4;
BTD = book-tax difference as described in Table 4; and
DFIN = discretionary accruals as described in Table 4.

and *DFIN*, and the results are similar to those in Panel C. Overall, the results of these frequency analyses support our contention that financial and tax reporting aggressiveness are positively related.

Although the correlations between financial and tax reporting aggressiveness thus far indicate a positive relation, these correlations do not control for incentives to tax plan or manage earnings. Thus, we also estimate the following OLS regression to control for tax planning and earnings management incentives:

$$\begin{aligned} TAX_{it} = {} & \beta_0 + \beta_1 DFIN_{it} + \beta_2 PTROA_{it} + \beta_3 NOL\_D_{it} + \beta_4 FOR\_D_{it} + \beta_5 LEV_{it} \\ & + \beta_6 MTB_{it} + \beta_7 AF\_D_{it} + \beta_8 NUM\_AN_{it} + \beta_9 EM1_{it} + \beta_{10} EM2_{it} \\ & + \beta_{11} EM3_{it} + \beta_{12} \Delta PTCFO_{it} + \beta_{13} SIZE_{it} + \varepsilon_{it} \end{aligned} \tag{4}$$

where *TAX* alternates between *DTAX* and *BTD*. Because we are not certain of the direction of the causality between financial and tax reporting aggressiveness, we also run the following OLS regression where *DFIN* is the dependent variable:[24]

$$\begin{aligned} DFIN_{it} = {} & \beta_0 + \beta_1 TAX_{it} + \beta_2 PTROA_{it} + \beta_3 NOL\_D_{it} + \beta_4 FOR\_D_{it} \\ & + \beta_5 LEV_{it} + \beta_6 MTB_{it} + \beta_7 AF\_D_{it} + \beta_8 NUM\_AN_{it} + \beta_9 EM1_{it} \\ & + \beta_{10} EM2_{it} + \beta_{11} EM3_{it} + \beta_{12} \Delta PTCFO_{it} + \beta_{13} SIZE_{it} + \varepsilon_{it}. \end{aligned} \tag{5}$$

Equations (4) and (5) control for incentives to tax plan (*PTROA*, *NOL_D*, *FOR_D*, *LEV*), incentives to manage earnings (*MTB*, *AF_D*, *NUM_AN*, *EM1*, *EM2*, *EM3*, Δ*PTCFO*), and firm size (*SIZE*). The tax planning incentive variables are the same as those in Table 2. The earnings management incentive variables include: growth opportunities (*MTB*), pressure from sell-side analysts (*AF_D* and *NUM_AN*), changes in pre-tax cash flow from operations (Δ*PTCFO*), and achieving certain earnings thresholds (*EM1*, *EM2*, *EM3*), which are defined as follows:

MTB_{it} = market value of common equity (Compustat #199 × #25) for firm *i* at year $t-1$, divided by book value of common equity (#60) for firm *i* at year $t-1$;
AF_D_{it} = 1 if firm *i* has at least one analyst covering the firm on I/B/E/S in year *t*, and 0 otherwise;
NUM_AN_{it} = number of analysts covering firm *i* as reported by I/B/E/S in year *t*, divided by total assets (#6) at year-end $t-1$;
$\Delta PTCFO_{it}$ = change in pre-tax cash flow from operations (#308 − #124 + #317) for firm *i* in year *t*, divided by total assets for firm *i* at year $t-1$;
$EM1_{it}$ = 1 if net income (#172) in year *t*, divided by the market value of common equity (#199 × #25) at year $t-1$, is greater than 0 and less than or equal to 0.01 for firm *i*, and 0 otherwise;
$EM2_{it}$ = 1 if the change in net income (#172) from year $t-1$ to year *t*, divided by the market value of common equity (#199 × #25) at year $t-2$ is greater than 0 and less than or equal to 0.01 for firm *i*, and 0 otherwise; and
$EM3_{it}$ = 1 if firm *i*'s actual earnings less the median analyst forecast for fiscal year *t* (as reported on I/B/E/S) is greater than 0 and less than or equal to 0.01, and 0 otherwise.[25]

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[24] We estimate Equations (4) and (5) with robust standard errors.

[25] *EM1*, *EM2*, and *EM3* have been explored in Burgstahler and Dichev (1997) and Brown and Caylor (2005), as well as many other studies.

To minimize the effect of outliers, we winsorize continuous variables in Equations (4), and (5) at the 1st and 99th percentiles.

Table 6, Panel A presents the results for the two estimations of Equation (4), where the dependent variables are *DTAX* and *BTD*. In both regressions, the coefficients on *DFIN* are positive and significant, consistent with a positive relation between financial and tax reporting aggressiveness. We also find that *DTAX* and *BTD* are significantly positively related to pre-tax profitability (*PTROA*), the presence of NOL carryforwards (*NOL_D*), higher leverage (*LEV*), changes in pre-tax cash flow from operations ($\Delta PTCFO$), and small positive net income (*EM1*), and significantly negatively related to the number of analysts following the firm (*NUM_AN*). Thus, firms with more aggressive tax reporting are more profitable, have greater NOL carryforwards, are more highly levered, have more positive changes in cash flow from operations, more likely to just achieve positive net income and lower analyst following.[26]

Table 6, Panel B contains the results for two estimations of Equation (5), where *DFIN* is the dependent variable and our measure of tax reporting aggressiveness (*TAX*) alternates between *DTAX* and *BTD*. Similar to Panel A, the coefficients on *DTAX* and *BTD* are significantly positive, consistent with a positive relation between financial and tax reporting aggressiveness. While the coefficients on the control variables in Panel A differ somewhat across the *DTAX* and *BTD* regressions, the control variables in Panel B reflect little variation, as the dependent variable remains the same (i.e., *DFIN*) across the two columns. In general, we find that financial reporting aggressiveness is positively related to pre-tax profitability (*PTROA*), the presence of NOL carryforwards (*NOL_D*), leverage (*LEV*), and market-to-book (*MTB*), and is negatively related to analyst following (*AF_D* and *NUM_AN*), the change in pre-tax cash flows from operations ($\Delta PTCFO$), and firm size (*SIZE*).

Robustness Tests

We run numerous sensitivity tests to determine the robustness of our results (results not tabulated).[27] First, changes in the tax cushion are reflected in permanent book-tax differences and thus potentially add measurement error to our measure of tax aggressiveness, *DTAX*.[28] To determine if our results are robust to a control for changes in tax cushion, we estimate the change in the tax cushion following Blouin and Tuna (2007).[29] When we include this variable in Equations (4) and (5) of Table 6, we continue to find positive and significant coefficients on *DFIN*, *DTAX*, and *BTD*, so our conclusions are unchanged.

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[26] Firms with the incentive to meet a positive earnings benchmark are also likely to have increasing net operating losses (NOLs). Increases in NOLs also increase deferred tax assets and reduce deferred tax expense. Lower deferred tax expense increases *PERMDIFF* and likely increases the residual (*DTAX*) leading to a positive association between *DTAX* and *EM1*. While we controlled for the change in NOLs in our regressions that calculate *DTAX*, we did not allow the coefficient to vary depending on a firm's position relative to the earnings benchmark; therefore, *EM1* could be controlling for measurement error attributable to the change in the NOLs.

[27] During our sample period, *PERMDIFF* is not affected by the financial accounting rules for stock options under SFAS No. 123 because neither book income (*BI*) nor taxable income ($(CFTE + CFOR)/STR$) include the effects of the tax benefits from stock options where $PERMDIFF = BI - (CFTE + CFOR)/STR - (DTE/STR)$].

[28] Since $PERMDIFF = BI - (CFTE + CFOR)/STR - (DTE/STR)$, increases in the tax cushion increase current tax expense and thus decrease *PERMDIFF* and our measure of tax aggressiveness, *DTAX*.

[29] Blouin and Tuna (2007) calculate changes in tax cushion as [current tax expense (Compustat #16 – #50) – cash taxes paid (#317) – change in taxes payable from balance sheet data (change in (#71 + #161))/lagged total assets (#6)]. We use their calculation, except that we obtain the change in taxes payable from the statement of cash flow (#305), where available. If this data is missing in Compustat, we compute this variable as the change in taxes payable from balance sheet data (change in (#71 + #161)). We exclude the tax benefit from stock options because the data necessary to compute that variable is available for just 15 percent of our sample and hand collection for the missing observations (30,000+) would be exceptionally costly.

TABLE 6
Multivariate Regression Analyses of the Relation between Financial and Tax Reporting Aggressiveness using Firm-Years from 1991–2005

Panel A: OLS Regressions of Measures of Tax Reporting Aggressiveness on *DFIN* and Controls for Tax Planning and Earnings Management Incentives

$$TAX_{it} = \beta_0 + \beta_1 DFIN_{it} + \beta_2 PTROA_{it} + \beta_3 NOL\_D_{it} + \beta_4 FOR\_D_{it} + \beta_5 LEV_{it} + \beta_6 MTB_{it} + \beta_7 AF\_D_{it} + \beta_8 NUM\_AN_{it} + \beta_9 EM1_{it} + \beta_{10} EM2_{it} + \beta_{11} EM3_{it} + \beta_{12} \Delta PTCFO_{it} + \beta_{13} SIZE_{it} + \varepsilon_{it} \quad (4)$$

	Dependent Variable *DTAX*	Dependent Variable *BTD*
Intercept	0.017***	−0.059***
DFIN	0.101***	0.031***
PTROA	0.287***	0.449***
NOL_D	0.034***	0.089***
FOR_D	0.050	−0.016***
LEV	0.049***	0.033***
MTB	0.001	−0.003***
AF_D	0.008*	0.003*
NUM_AN	−0.634***	−0.194***
EM1	0.041***	0.018***
EM2	−0.011**	0.000
EM3	−0.007	−0.002
Δ*PTCFO*	0.027*	−0.023***
SIZE	−0.007***	0.002***
Adj. R^2	0.037	0.261
n	45,235	45,235

Panel B: OLS Regressions of *DFIN* on Measures of Tax Reporting Aggressiveness and Controls for Tax Planning and Earnings Management Incentives

$$DFIN_{it} = \beta_0 + \beta_1 TAX_{it} + \beta_2 PTROA_{it} + \beta_3 NOL\_D_{it} + \beta_4 FOR\_D_{it} + \beta_5 LEV_{it} + \beta_6 MTB_{it} + \beta_7 AF\_D_{it} + \beta_8 NUM\_AN_{it} + \beta_9 EM1_{it} + \beta_{10} EM2_{it} + \beta_{11} EM3_{it} + \beta_{12} \Delta PTCFO_{it} + \beta_{13} SIZE_{it} + \varepsilon_{it} \quad (5)$$

	Independent Variable *TAX = DTAX*	Independent Variable *TAX = BTD*
Intercept	0.097***	0.103***
TAX	0.063***	0.088***
PTROA	0.194***	0.174***
NOL_D	0.017***	0.011***
FOR_D	0.001	0.003
LEV	0.038***	0.038***
MTB	0.001	0.001**
AF_D	−0.015***	−0.015***
NUM_AN	−0.095*	−0.118**
EM1	0.001	0.002
EM2	0.005	0.005

(*continued on next page*)

TABLE 6 (continued)

	Independent Variable ***TAX = DTAX***	**Independent Variable** ***TAX = BTD***
EM3	0.001	0.001
ΔPTCFO	−0.237***	−0.234***
SIZE	−0.020***	−0.021***
Adj. R^2	0.055	0.052
n	45,235	45,235

***, **, * Significantly different from zero at p-value <0.01, <0.05, <0.10 using a two-tailed test.

Variable Definitions (all variables are at year *t* unless stated otherwise):

DTAX = discretionary permanent differences as described in Table 4;
BTD = book-tax difference as described in Table 4;
DFIN = discretionary accruals as described in Table 4;
PTROA = pre-tax income (Compustat #170) divided by total assets at year $t-1$ (Compustat #6);
NOL_D = 1 if a firm has NOLs (Compustat #52); 0 otherwise;
FOR_D = 1 if the absolute value of pre-tax foreign income (Compustat #273) is > 0, and 0 otherwise;
LEV = sum of long-term debt (Compustat #9) and debt in current liabilities (Compustat #34) divided by total assets;
MTB = market value of common equity at year $t-1$ (Compustat #199 * Compustat #25) divided by book value of common equity at year $t-1$ (Compustat #60);
AF_D = 1 if a firm has at least one analyst covering the firm on I/B/E/S, and 0 otherwise;
NUM_AN = number of analysts covering the firm as reported by I/B/E/S divided by total assets at year $t-1$;
EM1 = 1 if net income (Compustat #172) divided by market value of common equity at year $t-1$ less than or equal to 0.01, and 0 otherwise;
EM2 = 1 if the change in net income divided by market value of common at year $t-2$ is less than or equal to 0.01, and 0 otherwise;
EM3 = 1 if firm *i*'s actual earnings less the median analyst forecast for fiscal year *t* (as reported on I/B/E/S) is greater than 0 and less than or equal to 0.01, and 0 otherwise;
ΔPTCFO = change in pre-tax cash flow from operations (Compustat #308 − #124 + #317) divided by total assets at year $t-1$; and
SIZE = natural log of total assets.

Second, to the extent that firms engage in similar tax planning activity from year to year, controlling for lagged permanent differences (*LAGPERM*) in our computation of *DTAX* removes some amount of tax aggressiveness from our measure. Thus, we estimate Equation (1) without *LAGPERM* and use the revised *DTAX* measure in Equations (4) and (5). The coefficient on *DFIN* (*DTAX*) in Equation (4) [(5)] is larger and remains positive and significant, suggesting the exclusion of *LAGPERM* generates a conservative estimate of the relation between *DTAX* and *DFIN*. Thus, our conclusions remain the same.

Last, our measure of tax reporting aggressiveness (*DTAX*) does not directly reflect tax planning activity that generates temporary book-tax differences. However, Wilson (2009) discusses how certain tax shelter transactions (e.g., lease-in-lease-out arrangements) generate temporary rather than permanent book-tax differences. Thus, our last sensitivity analysis includes controls for temporary differences in our tax shelter regression (Equation (2)), as well as our *DTAX* and *DFIN* regressions (Equations (4) and (5)). Inclusion of controls for the level and/or changes in temporary book-tax differences does not alter inferences for our variable of interest. Namely, *DTAX* continues to be able to detect tax shelter activity in Table 2 and continues to be significantly positively related to *DFIN* in Table 6.

In summary, throughout Tables 4, 5, and 6, we consistently find a positive and significant relation between financial and tax reporting aggressiveness. This positive relation persists across two different proxies for tax reporting aggressiveness (i.e., *DTAX* and *BTD*), across quintiles of financial and tax reporting aggressiveness (Table 5), despite controls for incentives for tax planning and earnings management (Table 6), and despite alternative specifications. Therefore, we conclude that the positive relation between financial and tax aggressiveness is robust.

Implications of Reporting Aggressiveness for Shareholder Wealth

To provide an understanding of the implications of aggressive financial and tax reporting for future stock returns, we perform stock returns analyses similar to those in Sloan (1996) and Xie (2001).[30] Specifically, we rank calendar year-end firms by year based on our measures of financial and tax reporting aggressiveness and partition our sample into quintiles of *DFIN* and *DTAX* for each year *t*. Consistent with Xie (2001), if investors correctly impound the information embedded in our measures of financial and tax reporting aggressiveness, then portfolios of stocks formed based on year *t* data should not earn significant abnormal stock returns in year $t+1$. We calculate the abnormal stock returns in year $t+1$ (SAR_{t+1}) as the firm's size-adjusted 12-month buy-and-hold raw stock return for year $t+1$ starting with the first day of the fourth month after the fiscal year-end.

Table 7, Panel A shows the mean SAR_{t+1} for quintiles of year *t DFIN* and *DTAX*. Panel A shows that the highest quintiles of *DFIN* and *DTAX* have the lowest mean size-adjusted future stock returns (SAR_{t+1} is -0.039 and -0.017 for *DFIN* and *DTAX*, respectively). Moreover, the mean return to a hedge portfolio that is long in stocks included in Q1 of *DFIN* (*DTAX*) and short in stocks included in Q5 of *DFIN* (*DTAX*) earns a mean positive size-adjusted return of 0.068 (0.023). Consistent with Xie (2001), the positive abnormal return to the *DFIN* hedge portfolio is significant. However, the abnormal return to the *DTAX* hedge portfolio is not significant at conventional levels.

To examine future stock returns associated with tax reporting aggressiveness while holding financial reporting aggressiveness constant, Table 7, Panel A also ranks firm-years by quintiles of *DTAX* within each quintile of *DFIN*. Moving across the quintiles of *DFIN*, we see that only the hedge portfolio of firms in the highest quintile of financial reporting aggressiveness earns significant abnormal returns ($SAR_{t+1} = 0.111$). Thus, holding financial reporting aggressiveness constant, investors generally impound the information in *DTAX* in a timely manner except for the firms with the most aggressive financial reporting.

Table 7, Panel B shows results for analyses similar to those in Panel A; however, we now hold tax reporting aggressiveness constant and rank firm-years by quintiles of *DFIN* within each quintile of *DTAX*. Panel B shows significant mean size-adjusted future stock returns for all the *DFIN*-based hedge portfolios except for firms with the least aggressive tax reporting (*DTAX* Q1). These results are generally consistent with those in Sloan (1996) and Xie (2001), which find that investors do not impound the information available in accrual-based measures into stock price in a timely manner.

To further examine whether investors impound financial statement data into stock prices in a timely manner, Table 7, Panel C shows results for stock return regressions similar to those in Hanlon (2005). In particular, we regress SAR_{t+1} on a vector of rank variables (X^Q) that are formed in the following manner. We first rank all the continuous independent variables and then sort them into quintiles for year *t*. We include *DFIN*, *DTAX*, and other variables that prior research suggests should be related to future returns. Equation (6)

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[30] Throughout the study, we utilize quintiles instead of deciles because we rank firms based on two dimensions, and the intersection of the extreme deciles of *DTAX* and *DFIN* would likely contain too few firms from which to draw broad conclusions.

TABLE 7
Implications of Aggressive Financial and Tax Reporting for Future Stock Returns Based on Firm-Years with December Year-Ends

Panel A: Abnormal Stock Returns for Year $t+1$ (SAR_{t+1}) Based on Quintile Ranks of *DTAX* and *DFIN* Measured in Year t, Including Quintile Ranks of *DTAX* within Quintiles of *DFIN*

				Within Each *DFIN* Quintile				
Quintile	SAR_{t+1} for *DFIN* Q's	SAR_{t+1} for *DTAX* Q's	SAR_{t+1} for *DTAX* Q's	**1**	**2**	**3**	**4**	**5**
1	0.029***	0.006	1	−0.019	0.071**	0.013	−0.009	0.019
2	0.049***	0.019**	2	0.049**	0.036*	−0.007	−0.025	−0.045**
3	0.014*	0.011	3	0.054**	0.030*	0.046**	0.012	−0.062***
4	0.005	0.041***	4	0.067***	0.051***	0.023	0.070***	−0.019
5	−0.039***	−0.017*	5	−0.01	0.059***	−0.004	−0.026	−0.092***
SAR_{t+1} for Q1–Q5	0.068***	0.023	SAR_{t+1} for Q1–Q5	−0.009	0.013	0.017	0.017	0.111***

Panel B: Abnormal Stock Returns for Year $t+1$ (SAR_{t+1}) Based on Quintile Ranks of *DTAX* and *DFIN* Measured in Year t, Including Quintile Ranks of *DFIN* within Quintiles of *DTAX*

				Within Each *DTAX* Quintile				
Quintile	SAR_{t+1} for *DFIN* Q's	SAR_{t+1} for *DTAX* Q's	SAR_{t+1} for *DFIN* Q's	**1**	**2**	**3**	**4**	**5**
1	0.029***	0.006	1	−0.013	0.093***	0.021	0.068***	−0.002
2	0.049***	0.019**	2	0.019	0.035*	0.038**	0.058***	0.048**
3	0.014*	0.011	3	0.024	0.029*	0.023	0.033*	−0.001
4	0.005	0.041***	4	−0.013	−0.025	0.015	0.058**	−0.056**
5	−0.039***	−0.017*	5	0.010	−0.036*	−0.042**	−0.016	−0.085***
SAR_{t+1} for Q1–Q5	0.068***	0.023	SAR_{t+1} for Q1–Q5	−0.023	0.130**	0.063**	0.084**	0.083**

(*continued on next page*)

TABLE 7 (continued)

Panel C: Regressions of Raw Stock Returns for Year t+1 on Quintile Ranks of *DTAX* and *DFIN* Measured in Year t

$$SAR_{t+1} = \beta_0 + \beta_1 DFIN^Q_t + \beta_2 DTAX^Q_t + \beta_3 DFIN^{Q5} \times DTAX^Q_t + \beta_4 MTB^Q_t + \beta_5 BETA^Q_t + \beta_6 PE^Q_t + \beta_7 RET^Q_t + \beta_8 CFO^Q_t + \varepsilon_{t+1}$$

	Column 1		Column 2		Column 3		Column 4	
	Coefficient	**t-stat**	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
Intercept	0.067	3.97***	0.047	3.03***	0.072	3.98***	0.061	3.27***
$DFIN^Q_t$	−0.043	−2.86***			−0.042	−2.80***	−0.020	−1.09
$DTAX^Q_t$			−0.016	−1.10	−0.014	−0.94	−0.000	−0.02
$DFIN^{Q5} \times DTAX^Q$							−0.062	−2.53**
MTB^Q_t	−0.151	−9.50***	−0.153	−9.66***	−0.152	−9.56***	−0.149	−9.32***
$BETA^Q_t$	0.039	2.76***	0.040	2.83***	0.038	2.73**	0.038	2.71**
PE^Q_t	−0.017	−1.13	−0.020	−1.33	−0.015	−1.00	−0.016	−1.11
RET^Q_t	−0.020	−1.43	−0.020	−1.43	−0.019	−1.37	−0.020	−1.45
CFO^Q_t	0.089	5.48***	0.106	6.90***	0.089	5.53***	0.087	5.37***
Adj. R^2	0.007		0.007		0.007		0.007	
n	22,657		22,657		22,657		22,657	

***, **, * Significantly different from zero at p-value <0.01, <0.05, <0.10 using a two-tailed test.

Variable Definitions:

SAR_{t+1} = size-adjusted 12-month buy-and-hold stock return for year t+1 starting with the first day of the fourth month after the fiscal year-end;
$DFIN^Q$ = quintile rank based on *DFIN* as discussed in Table 4;
$DTAX^Q$ = quintile rank based on *DTAX* as discussed in Table 4;
$DFIN^{Q5} \times DTAX^Q$ = interaction of a dummy variable equal to 1 if the quintile rank of *DFIN* is the highest (Q5), and 0 otherwise, with $DTAX^Q$;
MTB^Q = quintile rank based on the natural log of the ratio equal to the market value of common equity (Compustat #199 * Compustat #25) divided by book value of common equity (Compustat #60);
$BETA^Q$ = quintile rank based on the firm's beta from CRSP;
PE^Q = quintile rank based on the ratio equal to the market value of common equity divided by net income (Compustat #172);
RET^Q = quintile rank based on size-adjusted 12-month buy-and-hold stock return for year t starting with the first day of the fourth month after the fiscal year-end at year $t-1$; and
CFO^Q = quintile rank based on the cash flow from operations.

For each variable, we rank the calendar year-end firms by year t and partition our sample into quintiles based on their rank. We then subtract 1 from the quintile rank and scale by 4. This scaling allows the interpretation of each coefficient as the return to a zero investment portfolio.

illustrates our basic model specification, which converts our continuous data into rank variables:[31]

$$SAR_{t+1} = \beta_0 + \beta_1 DFIN^Q_t + \beta_2 DTAX^Q_t + \beta_3 DFIN^{Q5} \times DTAX^Q_t + \beta_4 MTB^Q_t + \beta_5 BETA^Q_t + \beta_6 PE^Q_t + \beta_7 RET^Q_t + \beta_8 CFO^Q_t + \varepsilon_{t+1}. \quad (6)$$

$DFIN^{Q5} \times DTAX^Q$ is the interaction of an indicator variable for the highest quintile of *DFIN* and the rank $DTAX^Q$ variable at year *t*; *MTB* is a the log of a firm's market-to-book ratio at year *t; BETA* is a firm's beta at year *t*; *PE* is a firm's price-to-earnings ratio at year *t*; *CFO* is a firm's cash flow from operations at year *t; RET_t* is the firm's size-adjusted 12-month buy-and-hold raw stock return for year $t-1$ starting with the first day of the fourth month after the fiscal year-end.[32]

If investors correctly impound the information reflected in *DFIN* and *DTAX* into stock price, then β_1, β_2, and β_3 should not be significant. In contrast, Table 7, Panel C shows that β_1 is significantly negative, consistent with the market overpricing financial reporting aggressiveness. However, the results suggest that the market correctly prices tax reporting aggressiveness, since β_2 is not significant. These results hold across columns 1–3.

The results for Table 7, Panel A suggest that the mispricing of tax reporting aggressiveness is concentrated in the highest quintile of financial reporting aggressiveness. To examine this issue in our multivariate regression, we insert a variable that interacts an indicator for the highest *DFIN* quintile with the rank $DTAX^Q$ variable (i.e., $DFIN^{Q5} \times DTAX^Q$). Interestingly, this interaction term in Equation (6) reveals that the significant coefficients on $DFIN^Q$ in the first three columns of Table 7, Panel C are primarily attributable to the abnormal stock returns that characterize the *DTAX* hedge portfolio for the highest *DFIN* quintile (0.111 in Panel A). In particular, the coefficient on $DFIN^{Q5} \times DTAX^Q$ is negative and significant and the coefficient on $DFIN^Q$ is *not* significant in the fourth column of Table 7. While the results in Table 7 for *DFIN* are similar to those in Sloan (1996), Xie (2001), and Hanlon (2005), the results examining mispricing associated with the interaction of financial and tax reporting aggressiveness are new to the literature.

V. CONCLUDING REMARKS

Since the early 1990s, U.S. corporations have reported increasing differences between the income reported to shareholders and the income reported to the Federal government. Some observers interpret this growing gap as indicating an increase in aggressive tax reporting behavior, while others suggest the growing differences between book and taxable incomes may reflect increased earnings management rather than increased tax planning. Prior research has explored the trade-offs that managers face when making financial and tax reporting decisions, implicitly assuming that extensive conformity between financial and tax accounting rules means that firms must decide which measure of income is more important to manage, and forgo management efforts related to the other.

In contrast, recent trends highlight that firms do not always trade-off financial and tax reporting decisions, and in fact some firms may be reporting higher book income to shareholders *and* lower taxable income to tax authorities. Motivated by the recent spate of accounting scandals, widespread tax shelter activity, and the growing book-tax gap, we investigate this possibility by examining the relation between financial and tax reporting aggressiveness, a relatively unexplored area of accounting research.

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[31] Following Bernard and Thomas (1990), we subtract 1 from the quintile rank and scale by 4. This scaling allows the interpretation of each coefficient as the return to a zero investment portfolio.

[32] We estimate Equation (6) with robust standard errors.

We develop a measure of tax reporting aggressiveness that statistically detects tax shelter activity at least as well as, and often better than, other measures of tax reporting aggressiveness used in the literature to date. Using this measure and the discretionary accruals measure frequently used in the accounting literature to proxy for financial reporting aggressiveness, we find a strong, positive relation between financial and tax reporting aggressiveness. Our results suggest insufficient costs exist to offset basic financial and tax reporting incentives, such that nonconformity between financial accounting standards and tax law allows firms to manage book income upward and taxable income downward in the same reporting period. Last, consistent with Xie (2001), our stock returns analysis confirms that investors do not fully incorporate the information in discretionary accruals into stock price and reveals that much of investors' mispricing is attributable to a hedge portfolio based on our measure of tax aggressiveness for firms with the most aggressive financial reporting.

Our research should be useful to regulators attempting to reduce corporate malfeasance, to investors concerned about the consequences of aggressive corporate reporting, and to academics investigating aggressive tax and financial reporting behaviors. Future research should focus on why financial and tax reporting aggressiveness are positively related and explore the characteristics associated with aggressive corporate decision making.

APPENDIX

NUMERICAL EXAMPLE OF THE IMPACT OF TAX SHELTER ACTIVITY ON *PERMDIFF*

This appendix contains a numerical example of how a "transfer pricing" tax shelter (included in Graham and Tucker [2006] and Wilson [2008]) impacts the computation of *PERMDIFF*, which is the basis for our measure of tax reporting aggressiveness (*DTAX*). This example includes a U.S. parent corporation that is subject to a 35 percent U.S. statutory tax rate and its wholly owned foreign subsidiary that is subject to a 15 percent foreign tax rate. We assume that the parent corporation designates all profits earned by the foreign subsidiary as permanently reinvested abroad (and thus the parent corporation is not required to recognize deferred tax expense in its financial statements as the subsidiary generates foreign source income).

The example also assumes that the parent corporation purchases an asset from the foreign subsidiary. This asset has a fair market value of \$50 but cost the subsidiary \$25 to produce. Excluding any intercompany transactions, the parent corporation has \$1,000 of pre-tax income while the foreign subsidiary has \$100 of pre-tax income. Last, to minimize the complexity of the example, we assume that neither the parent nor its subsidiary have any temporary or permanent book-tax differences, except those potentially generated by the inter-company sale of the asset.

The table below illustrates how the use of strategic transfer-pricing arrangements that shift profits from the parent corporation to the subsidiary increase worldwide net income and *PERMDIFF*. The first set of analyses show worldwide net income in the absence of income shifting (\$723.75), while the second set of analyses show worldwide income in the presence of income shifting (\$733.75). In the latter case, the parent corporation has paid the subsidiary an inflated price (\$100) for the inter-company transaction, rather than the fair market value of the asset (\$50). This increased transfer price (by \$50) does not affect worldwide pre-tax income, which is \$1,075 in both cases. However, because the inflated transfer price shifts some of the parent's taxable income to the foreign subsidiary, the combined companies pay less tax and thus report higher net income in the income shifting case. Since *PERMDIFF = BI − (CFTE + CFOR)/STR − (DTE/STR)*, the transfer pricing scheme decreases current federal tax expense (*CFTE* by $17) more than it increases current foreign tax expense (*CFOR* by $7.50), resulting in net tax savings and greater *PERMDIFF* ($100.00).

	Transfer Price Based on FMV ($50)			**Transfer Price is Inflated ($100)**		
	Parent	**Foreign Sub**	**Worldwide**	**Parent**	**Foreign Sub**	**Worldwide**
PTI	$1,000	$100	$1,100	$1,000	$100	$1,100
Interco sale:						
Price	($50)	$50	$0	($100)	$100	$0
Less: Cost		($25)	($25)		($25)	($25)
Net		$25	$25		$75	$75
Adjusted PTI	$950	$125	$1,075	$900	$175	$1,075
Total tax expense:						
Deferred	$0	$0	$0	$0	$0	$0.00
Current	$332.50	$18.75	$351.25	$315.00	$26.25	$341.25
Total	$332.50	$18.75	$351.25	$315.00	$26.25	$341.25
Net Income	$617.50	$106.25	$723.75	$585.00	$148.75	$733.75
*PERMDIFF****			$71.43			$100.00

**** PERMDIFF = Total PTI − [(CFTE + CFOR)/35%] − (DTE/35%).*

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The Association between Management Earnings Forecast Errors and Accruals

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ABSTRACT: We investigate the association between errors in management forecasts of subsequent year earnings and current year accruals. In an uncertain operating environment, managers' assessments of their firms' business prospects are imperfect. Since managers' imperfect business assessments influence both accruals generation and earnings projection, we hypothesize that management earnings forecasts exhibit greater optimism (pessimism) when accruals are relatively high (low). Consistent with this hypothesis, we find a positive association between management earnings forecast errors and accruals. This positive association is stronger for firms operating in a more uncertain business environment and for firms in industries exhibiting greater covariation between accruals and growth-related activities. Moreover, this positive association is significant when accruals likely reflect managers' true beliefs about firms' business prospects, but is nonexistent when accruals are likely manipulated to boost managers' trading gains. Supplementary analysis reveals that the presence of management earnings forecasts does not significantly reduce accrual mispricing.

Keywords: *voluntary disclosure; management earnings forecasts; mandatory disclosure; accruals.*

Data Availability: *Data are available from public sources indicated in the text.*

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I. INTRODUCTION

Mandatory and voluntary disclosures represent two important channels through which managers communicate information to outside shareholders.[1] While a considerable literature has shown that both types of disclosure contain value-relevant information and significantly influence security prices (Kothari 2001; Healy and Palepu 2001), the question of whether voluntarily disclosed information contains errors that can be predicted based on mandated reported information remains largely unexplored. Investigation of this issue can further our understanding of the informational value of voluntary disclosure, with corresponding implications for investors and standard-setters.

The objective of this study is to examine the association between errors in management forecasts of subsequent year earnings and current year accruals. Accruals represent a key aspect of mandatory reporting. Prior studies suggest that investors and financial analysts fail to fully understand the implications of accruals for future earnings (Sloan 1996; Bradshaw et al. 2001). Managers, as corporate decision makers and financial information suppliers, presumably possess superior private information about their firms' business prospects and accruals-generation processes. Management earnings forecasts thus could be free from predicable errors based on historically reported accruals. However, in an uncertain operating environment, managers' knowledge about their firms' business prospects is imperfect, which can lead to unintentional errors in managers' assessments of future firm performance. When managers have flexibility to convey their imperfect business assessments through both accruals and earnings forecasts, these two information disclosures likely contain common errors. If so, we expect management earnings forecasts to exhibit greater optimistic (pessimistic) biases when accruals are relatively high (low), as explained further in Section II.

Our proposition that managers' imperfect foresight manifests in both voluntary and mandatory disclosures is in line with recent studies showing that managers' personal beliefs affect multiple dimensions of corporate decisions. Malmendier and Tate (2005, 2008) show that CEOs who overestimate the future returns of their firms (measured by a failure to divest company-specific risk on their personal accounts) tend to undertake excessive capital investments and pursue unnecessary acquisitions when they have abundant internal funds at their disposal. Ben-David et al. (2007) further document that CFO overconfidence (measured as miscalibrated beliefs based on a survey) induces distortions in a series of corporate decisions, including investment, external financing, and payout decisions. Similar to these studies, our proposition that managers' imperfect assessments of business prospects simultaneously affect both mandatory and voluntary disclosures is consistent with the spillover effect of managerial judgmental errors from one domain to another.

Using the First Call's Company Issued Guidance (CIG) database, we find a significantly positive association between subsequent year management earnings forecast errors (defined as the difference between forecasted earnings and actual earnings) and current year accruals. If this positive association stems from unintentional errors in managers' assessments of business prospects, then we expect to observe a stronger positive association among firms operating in a more uncertain business environment in which managers are likely to make more substantial judgmental errors and also rely more heavily on their estimations and projections to generate accruals. Empirical results confirm our expectation. We find that the positive relation between management earnings forecast errors and accruals is stronger for firms having higher cash flow volatility, higher sales growth volatility, or longer operating cycles.

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[1] The U.S. Securities and Exchange Commission (SEC) mandates a variety of corporate filings that provide information on firms' financial performance, governance structure, compensation practice, and major corporate transactions. Managers also voluntarily provide the capital market with additional relevant disclosures through forecasts of key accounting numbers (such as earnings, cash flows, and sales), press releases, conference calls, Internet sites, and other communication channels.

Even with uncertainty in the operating environment, a positive association between management earnings forecast errors and accruals might not exist if managers have little flexibility in conveying their business assessments through accruals. The degree to which managers can utilize accruals to convey their subjective beliefs varies depending on the nature of the business, industry practice, and available accounting choices allowed by Generally Accepted Accounting Principles (GAAP). If the positive association between management forecast errors and accruals arises from managerial judgmental errors being revealed in both information disclosures, then we expect to find a stronger positive association for firms exhibiting higher covariation between accruals and growth-related activities that capture managers' assessments of business prospects (e.g., employee growth, as proposed by Zhang [2007]). Empirical results show that for industries in which accruals highly covary with employee growth, management forecast errors are positively associated with accruals. In contrast, for industries in which accruals show little covariation with employee growth, the relation between management forecast errors and accruals is insignificant. These findings lend further support to the proposition that common errors embedded in managers' business assessments manifest in both accruals and earnings forecasts, which induces a positive association between management earnings forecast errors and accruals.

An alternative explanation for our observed positive association between management earnings forecast errors and accruals is that managers *intentionally* manipulate accruals upward (downward) and then intentionally make optimistic (pessimistic) earnings forecasts for the purpose of reaping private benefits. To distinguish this intentional misrepresentation explanation from that in which misassessment is unintentional, we rely on the direction of managers' trading of stocks and options (executed shortly after management earnings forecasts) to infer managers' true beliefs about future business prospects. A net purchase (sale) of stocks and options by top management likely reveals managers' favorable (unfavorable) assessments of future business prospects.[2] We find that the association between management earnings forecast errors and accruals is significantly positive when accruals are likely to reflect managers' true beliefs about firms' business prospects (i.e., high/low accruals followed by insider purchases/sales). On the other hand, this association is virtually nonexistent when accruals are likely manipulated to boost subsequent trading gains and thus are less likely to reflect managers' true beliefs about firms' business prospects (i.e., high/low accruals followed by insider sales/purchases). These findings do not support the intentional misrepresentation view that managers manipulate accruals and earnings forecasts in the same direction in order to boost trading gains, but are consistent with the misassessment explanation that both accruals and earnings forecasts reflect managers' unintentional errors about firms' business prospects. It should be noted, however, that there is high litigation risk surrounding insider trading, which potentially deters managers from issuing intentionally biased earnings forecasts shortly before their trades. Given that managers could face other opportunistic incentives (besides insider trading) when making disclosure decisions, our evidence does not completely rule out managerial intentional misrepresentation as a potential explanation for managers' accrual-related forecast errors.

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[2] Our inference that insider sales (purchases) likely signal managers' favorable (unfavorable) views about future firm performance is in line with prior evidence on insider trading (e.g., Hirschey and Zaima 1989; Seyhun 1990; John and Lang 1991; Lee et al. 1992). Although non-information-based liquidity trading may add noise to our tests, it unlikely biases our inferences toward a particular direction.

In supplementary analysis, we examine whether the presence of management earnings forecasts affects accrual mispricing. Prior studies generally propose that voluntary disclosure facilitates more efficient pricing of mandated reported accounting information (e.g., Kimbrough 2005; Drake et al. 2007; Louis et al. 2008). However, given that management earnings forecasts contain an accrual-related bias, whether the presence of management earnings forecasts can alleviate accrual mispricing is unclear *ex ante*, as explained in Section VI. Our results suggest that the presence of management earnings forecasts does not mitigate accrual mispricing.

This study extends the literature on the relation between mandatory and voluntary disclosures. As reviewed in Section II, prior research has largely focused on the occurrence or the quantity of voluntary disclosure and its relation with mandatory reporting properties. Our study extends prior research by examining the *error* in voluntary disclosure (i.e., management earnings forecast error) and its relation with a key aspect of mandatory reporting: accruals. Our results indicate that, when mandatory reporting (such as accrual reporting) and voluntary disclosure (such as management earnings forecast) both involve a high degree of managerial subjectivity, voluntarily disclosed information can contain similar biases as mandated reported information, which potentially lessens the *incremental* informational value of voluntary disclosure.

Our study also provides new evidence for the management earnings forecast literature. Prior research has proposed that management earnings forecasts, by revealing managers' superior private information, help reduce information asymmetry, preempt costly shareholder litigation, and enhance corporate reputation for transparent financial reporting (Hirst et al. 2008). We add to this literature by showing that management earnings forecasts contain predictable errors in relation to historically reported accruals. Our results caution investors to carefully evaluate management earnings forecasts when forming their earnings expectations, especially when the firm operates in a highly uncertain business environment or belongs to an industry in which accruals highly covary with growth-related activities.

Furthermore, our findings have implications for regulators and standard-setters. Before drafting changes to accounting standards or proposing disclosure-related policies, regulators and standard-setters need to consider the possibility that mandatory and voluntary disclosures could display common errors under certain circumstances. Encouraging expanded voluntary disclosures or greater managerial subjectivity in financial reporting might not necessarily improve a firm's information environment if the resulting corporate disclosures simply reflect common errors due to managers' misassessments of business prospects.

Finally, our study contributes to the accrual anomaly literature. Since Sloan (1996), this literature has not reached a consensus on whether the accrual-based hedge portfolio returns reflect market mispricing of accruals, compensation for higher risk associated with extreme accruals, or unknown research design flaws.[3] Bradshaw et al. (2001) document that analysts make earnings forecasts that are more optimistic (pessimistic) following periods of high (low) accruals, thus supporting the market mispricing interpretation of the accrual anomaly. Since management earnings guidance significantly influences analysts' forecasting activities

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[3] Prior research on accrual anomaly largely concurs that the accrual-based hedge portfolio returns reflect investors' inefficient processing of accruals information (e.g., Sloan 1996; Bradshaw et al. 2001; Xie 2001; Collins et al. 2003; Fairfield et al. 2003). Recently, a few studies propose rational explanations for the accrual-based hedge portfolio returns (e.g., Khan 2008). Furthermore, Kraft et al. (2006) identify a few research design flaws that exist in prior accrual mispricing studies.

(e.g., Hassell et al. 1988), our findings imply that managers' accrual-related forecast errors might be a source of analysts' accrual-related forecast biases.[4] Our evidence thus further supports the notion that the accrual anomaly is at least partly driven by market participants' failure to correctly assess the future earnings implications of accruals and cannot be entirely attributed to omitted risk factors or research design flaws.

In Section II we review the literature related to our research question. Section III develops our hypotheses. Section IV describes the sample selection process and the empirical regression model used to test the relation between management earnings forecast errors and accruals. Section V presents and discusses empirical results. Section VI provides supplementary analysis concerning the impact of management earnings forecasts on accrual mispricing. Section VII concludes.

II. RELATED LITERATURE

Prior Literature on Management Earnings Forecast Errors

Prior studies have proposed various incentive-related factors that could motivate managers to bias their earnings forecasts to inflate market earnings expectations (Frost 1997; Koch 2002; Rogers and Buskirk 2006), deter potential industry entrants (Newman and Sansing 1993), facilitate security issuance (Frankel et al. 1995; Lang and Lundholm 2000), improve trading profitability (Aboody and Kasznik 2000; Noe 1999; Rogers and Stocken 2005), or reduce expected legal costs (Skinner 1994, 1997; Baginski et al. 2002; Rogers and Stocken 2005). Aside from managerial incentives, McNichols (1989) finds that management earnings forecasts contain predictable errors in relation to historical stock returns, suggesting that managers fail to efficiently incorporate information contained in past stock prices into their earnings forecasts. Despite these studies, little research has examined the relation between management earnings forecast errors and mandated reported accounting information.[5]

Prior Literature on the Relation between Mandatory and Voluntary Disclosures

Prior studies that examine the relation between mandatory and voluntary disclosures are motivated primarily by the discretionary nature of voluntary disclosure. Analytically, Einhorn (2005) demonstrates that various features of mandatory reporting (such as the level of discretion in mandatory reporting and the information quality of mandatory disclosure) affect managers' propensity to provide voluntary disclosure. Empirically, it is well documented that volatile earnings reduce the frequency of management earnings forecasts (e.g., Waymire 1985; Cox 1985; Imhoff 1978). More recently, Francis et al. (2008) find that firms that exhibit good earnings quality provide a larger quantity of voluntary disclosures in annual reports and 10-Ks than do firms exhibiting poor earnings quality.

Several other studies use market-based measures of mandatory reporting properties to examine the relation between mandatory and voluntary disclosures. Lang and Lundholm (1993) find a negative association between the earnings-return correlation and disclosure quality ratings published by the Association for Investment Management Research (AIMR).

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[4] Alternatively, the inefficiency in analyst earnings forecasts with respect to accruals could be independent of managers' accrual-related forecast errors if analysts and managers independently make judgmental errors in assessing firms' business prospects.

[5] A related study by Kasznik (1999) examines the relation between management earnings forecast errors and concurrent discretionary accruals. He predicts and finds that legal costs and reputation concerns motivate managers to inflate accruals to minimize optimistic forecast errors. The key difference between our study and Kasznik (1999) is that we focus on *current* accruals and their relation with management forecasts of future earnings, while Kasznik (1999) focuses on *future* accruals reported *after* management earnings forecasts.

Tasker (1998) also documents a negative association between her proxy for the informativeness of financial statements and the occurrence of conference calls. However, Lennox and Park (2006) find that the historical earnings response coefficient is positively associated with management's issuance of earnings forecasts.

Overall, this line of research has generally focused on the occurrence or the quantity of voluntary disclosure and its relation with mandatory reporting properties. In this study we extend prior research by examining the *error* in voluntarily disclosed forward-looking information (i.e., management earnings forecast error) and its relation with a key aspect of mandatory reporting: accruals.

III. HYPOTHESIS DEVELOPMENT

Relation between Management Earnings Forecast Errors and Accruals

We hypothesize that mandatory and voluntary disclosures contain common errors resulting from managers' imperfect assessments of their firms' business prospects. A firm's operating environment is replete with uncertainty due to changing business conditions (such as unpredictable shifts in market demand and competitor strategies). This implies that managers' knowledge of their firms' business environment is imperfect. Managers' imperfect knowledge unavoidably generates errors in managers' assessments of business prospects. In addition, uncertainty in the operating environment can induce or exacerbate managers' cognitive biases in processing information (e.g., Hirshleifer 2001; Zhang 2006), which also leads to errors in managers' assessments of business prospects. When managers communicate their biased business assessments through both voluntary and mandatory disclosures, these two information disclosures likely contain common errors.

To empirically test this conjecture, we examine whether errors in management forecasts of subsequent year earnings (defined as the difference between forecasted earnings and actual earnings) are positively related to current year accruals. We focus on management earnings forecasts instead of other forms of voluntary disclosure because, in addition to reflecting managers' projections about firms' prospects, these forecasts are quantitative and *ex post* verifiable.[6] We choose to examine accruals because the generation of accruals represents a key aspect of mandatory reporting and involves substantial managerial projections about firms' business prospects. Since forecasting earnings and generating accruals both involve a high degree of managerial subjectivity, errors embedded in managers' business assessments are likely to manifest in both management earnings forecasts and accruals. For instance, when managers are optimistic (pessimistic) about their firms' future market demand, they tend to over- (under-) stock inventory, thus creating high (low) level of accruals through increases in inventory.[7] At the same time, management earnings forecasts would display similar optimism (pessimism), reflecting managers' personal beliefs about future firm performance. Therefore, we hypothesize that management earnings forecasts contain greater optimistic (pessimistic) errors when accruals are relatively high (low), or a positive relation between management earnings forecast errors and accruals.[8]

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[6] In contrast, other types of voluntary disclosures are not necessarily followed by confirmatory reports for verification (such as projections of market trend) or do not reveal forward-looking information (such as disclosures of historical customer satisfaction).

[7] Similarly, when managers are optimistic (pessimistic) about the collectability of existing accounts receivable, they tend to under- (over-) estimate receivable allowances, thus creating a high (low) level of accruals through increases in accounts receivable.

[8] Besides reflecting managers' personal assessments about firms' business prospects, accruals are also influenced by firms' underlying economics. In subsequent empirical tests, we control for various firm characteristics (such as operating performance and growth) to account for firms' underlying economics that could affect accruals.

H1: There is a positive association between management earnings forecast errors and accruals.

Impacts of Operating Uncertainty and Reporting Flexibility

A positive association between management forecast errors and accruals (as proposed above) will exist as long as the following two conditions hold. First, there is *uncertainty* in the operating environment such that managers unavoidably commit errors in assessing their firms' business prospects. Second, managers have *flexibility* to convey their subjective assessments about firms' business prospects through both accruals and earnings forecasts. The cross-sectional variations in operating uncertainty and in managerial reporting flexibility thus have predictable implications for the association between management earnings forecast errors and accruals.

Greater uncertainty in the operating environment naturally results in more substantial errors in managers' assessments of firms' business prospects. Greater uncertainty also leaves more room for psychological biases (Hirshleifer 2001). Hence, in a more uncertain operating environment, management earnings forecasts and accruals are likely affected to a greater extent by common errors in managers' business assessments, which strengthens the positive relation between management forecast errors and accruals. Furthermore, firms operating in a highly uncertain business environment face more volatile business conditions, spurring them to rely more heavily on managerial estimations and projections in the accruals generation process. Consequently, managers' misassessments of business prospects, which are revealed through their earnings forecasts, are more likely to influence accruals under greater operating uncertainty. We therefore expect to observe a stronger positive association between management forecast errors and accruals when there is greater uncertainty in firms' operating environment.[9]

H2: The positive association between management earnings forecast errors and accruals is stronger for firms operating in a more uncertain business environment.

Even with uncertainty in the operating environment, a positive association between management forecast errors and accruals might not exist unless managers are allowed to convey their imperfect business assessments through *both* disclosure channels. While management earnings forecasts primarily reflect managers' personal beliefs regarding firms' business prospects, reported accruals need not. The degree to which accruals convey managers' subjective assessments varies with the nature of the business, industry practice, and available accounting choices allowed by GAAP. For example, managers in retail industries may increase inventory purchases to convey their expectations of improving future market demand. However, such a strategy would not be applicable to service industries or firms with no inventories. When managers have limited flexibility in communicating their projections through accruals, the errors embedded in management earnings forecasts may well not appear in accruals, thus weakening the positive association between management forecast errors and accruals.

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[9] Besides the uncertainty in the operating environment, managers' inherent talent (such as innate intelligence and education level) and learned skills (through professional experience) could also affect the extent of managerial misassessments. However, these data are generally not available to the academic researcher and are difficult to measure empirically. Moreover, proxies for managerial skills might be directly influenced by operating uncertainty. For example, forecast frequency and accuracy could proxy for managerial experience and skills (in forecasting earnings), but they are also heavily influenced by the predictability of earnings and the overall uncertainty in the operating environment.

We use the covariation between accruals and managers' growth-related activities to measure managerial flexibility in using accruals to convey their business assessments. The premise is that growth-related activities capture managers' assessments of their firms' business prospects. If managers have plenty of flexibility to convey their business assessments through accruals, then we would observe high covariation between accruals and growth-related activities. We therefore hypothesize that firms exhibiting high covariation between accruals and growth-related activities have a stronger positive association between management forecast errors and accruals.

> **H3:** The positive association between management earnings forecast errors and accruals is stronger for firms that exhibit high covariation between accruals and growth-related activities.

An Alternative Explanation—Intentional Misrepresentation of Information Disclosures

We have proposed that unintentional errors in managers' assessments of future business prospects result in a positive association between management earnings forecast errors and accruals. However, we recognize that this positive association could also arise from managers' intentional misrepresentation of multiple information disclosures for the purpose of reaping private benefits. Such intentional misrepresentation is costly to managers, due to potential legal actions from shareholders (e.g., Skinner 1994, 1997; Francis et al. 1994) and loss of reputation (e.g., Williams 1996; Hutton and Stocken 2007). Nevertheless, the expanded safe-harbor provisions in the Private Securities Litigation Reform Act of 1995 alleviate the legal concern associated with forward-looking disclosures, which potentially increases managers' propensity for intentional misrepresentation.

Managers have various incentives to bias their earnings forecasts and reported accruals. For instance, managers might manipulate accruals downward prior to share repurchases or stock option grants to boost potential gains from repurchased stocks or awarded stock options (Gong et al. 2008; Baker et al. 2003), and these firms may also provide pessimistic earnings forecasts prior to these events (Brockman et al. 2008; Aboody and Kasznik 2000). Alternatively, external financing activities may motivate managers to inflate accruals (Teoh et al. 1998a, 1998b) and knowingly introduce optimistic biases to voluntary disclosures (Lang and Lundholm 2000), although empirical evidence is still mixed concerning these conjectures (Ball and Shivakumar 2008; Shivakumar 2000; Frankel et al. 1995). It is worth noting that prior studies only separately examine managers' manipulation of accruals or management earnings forecasts. Whether managers *simultaneously* utilize both information disclosures to reap private benefits remains an empirical issue.

To distinguish the intentional misrepresentation explanation from the unintentional misassessment view, we examine insider trading (executed shortly after management earnings forecasts), which has potential to reveal managers' assessments of business prospects. Specifically, we rely on the trading direction to infer managers' true beliefs about future firm performance, with share purchases (sales) indicating favorable (unfavorable) outlooks. We then identify cases where accruals are consistent with managers' true beliefs about future firm performance (i.e., high/low accruals followed by share purchases/sales) and cases where accruals are likely manipulated to boost managers' trading gains and thus less likely reflect managers' true beliefs about future firm performance (i.e., high/low accruals followed by share sales/purchases). Our purpose is to examine whether the positive association between management forecast errors and accruals is attributable to unintentional misassessments (likely captured by the former case) or intentional manipulation (likely captured by the latter case).

If it is the unintentional misassessment that drives the positive association between management forecast errors and accruals, then we expect this positive association to be stronger for firms with accruals reflecting managers' true beliefs about future firm performance than firms in which accruals are likely manipulated to enhance managers' trading profitability. In other words, we expect a stronger positive association between management forecast errors and accruals when managers purchase (sell) shares following periods of high (low) accruals.

> **H4a:** Under the unintentional misassessment explanation, the positive association between management earnings forecast errors and accruals is stronger for firms in which managers purchase (sell) shares following periods of high (low) accruals than for firms in which managers sell (purchase) shares following periods of high (low) accruals.

Alternatively, if intentional misrepresentation underlies the positive association between management forecast errors and accruals, we expect this positive association to be stronger when accruals primarily serve to boost managers' trading gains as opposed to revealing managers' subjective business assessments. In other words, we expect a stronger positive association between management forecast errors and accruals when managers sell (purchase) shares following periods of high (low) accruals.

> **H4b:** Under the intentional misrepresentation explanation, the positive association between management earnings forecast errors and accruals is stronger for firms in which managers sell (purchase) shares following periods of high (low) accruals than for firms in which managers purchase (sell) shares following periods of high (low) accruals.

IV. SAMPLE SELECTION AND RESEARCH DESIGN

Sample Selection

We collect management earnings forecasts for fiscal years 1996–2006 from First Call's Company Issued Guidance (CIG) database.[10] We only include point and range forecasts because forecast errors are less clearly defined for other forms of forecasts (such as open-ended and qualitative). To ensure that managers have knowledge of current year accruals when issuing subsequent year earnings forecasts, for each firm-year we retain the first management forecast for year $t+1$ earnings per share issued at or after current year (year t) earnings announcement.[11] To avoid confounding effects of year $t+1$ quarterly earnings, we exclude management earnings forecasts issued at or after the first quarter earnings announcement of year $t+1$.[12] We also exclude firms with insufficient data on the Compustat and CRSP to measure accruals and related firm characteristics. The sample selection procedure, summarized in Panel A of Table 1, yields a final sample of 1,648 firms with 4,443 firm-year observations. We present the time-series distribution of the sample in Panel B of Table 1. As shown, the number of forecasting firms increases over the sample

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[10] The sample period starts in 1996 because the passage of the Private Securities Litigation Reform Act of 1995 expanded the safe-harbor protection to firms issuing forward-looking information and thus changed firms' legal environment.

[11] Accruals information is fully disclosed in annual reports and might not be available at earnings announcement to outsiders, although an increasing percentage of firms voluntarily disclose accruals information at earnings announcement (e.g., Louis et al. 2008). We assume that managers possess full knowledge of year t accruals by year t earnings announcement. Our results are qualitatively similar if we measure management forecast errors based on the first management earnings forecasts issued during the second quarter of year $t+1$.

TABLE 1
Sample Selection and Distribution

Panel A: Sample Selection

Annual management earnings forecasts for fiscal years 1996–2006	38,357
Less: Qualitative, maximum, and minimum management earnings forecasts	(3,837)
Less: Missing earnings announcement dates from Compustat	(2,129)
Point and range annual management earnings forecasts	32,391
Representing firm-years	11,260
Less: management forecasts issued prior to year t earnings announcement or after year $t+1$ first quarter earnings announcement	(25,629)
Management earnings forecasts issued at or after year t earnings announcement but before year $t+1$ first quarter earnings announcement	6,762
Representing firm-years	5,794
Less: firm-years missing control variables in Equation (1) during 1995–2005	(1,351)
Final Sample	4,443

Panel B: Sample Distribution

Forecast Year	Number of Firm-Years	Percent (%)
1996	37	0.83
1997	61	1.37
1998	74	1.67
1999	143	3.22
2000	154	3.47
2001	453	10.20
2002	548	12.33
2003	648	14.58
2004	780	17.56
2005	755	16.99
2006	790	17.78
Total	4,443	100.00

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[12] Our sample selection procedure excludes firms that only issue *quarterly* management earnings forecasts and firms that only issue annual management earnings forecasts *after* the first quarter earnings announcement of year $t+1$. These excluded firms account for nearly 50 percent of all firms covered in the First Call's CIG database. We acknowledge that our results might not generalize to firms that only issue quarterly earnings forecasts, although the positive association between management forecast errors and accruals continues to be significant for annual forecasts issued during the second and third quarters of year $t+1$ (untabulated). It is also worth noting that a large proportion of management forecasts for year $t+1$ earnings are issued with year t earnings announcement (87 percent for our sample), which may exhibit different properties than management forecasts made in isolation (e.g., Atiase et al. 2005). Nevertheless, in untabulated results we find that the positive association between management earnings forecast errors and accruals is significant for management earnings forecasts issued in isolation (13 percent of our sample) as well as management earnings forecasts issued with the earnings announcement (87 percent of our sample).

period, consistent with an increasing propensity for managers to provide earnings guidance over time and/or more comprehensive coverage by First Call over time.

Research Design

To test our hypotheses, we regress management earnings forecast errors on accruals and previously identified determinants of management forecast errors, using the ordinary least squares regression with standard errors adjusted for heteroscedasticity and firm-level clustering (firm subscripts are suppressed):

$$MFE_{t+1} = \alpha + \beta WCACC_t + \sum \gamma_j Controls_{j,t} + \varepsilon_{t+1}. \tag{1}$$

The variables in Equation (1) are defined in the Appendix and discussed below.

We measure management earnings forecast errors (*MFE*) as the difference between the first management forecast of year $t+1$ earnings per share (issued at or after year t earnings announcement but before the first quarter earnings announcement of year $t+1$, adjusted for stock splits and dividends) and year $t+1$ actual earnings per share, scaled by the closing share price at the end of year t. Our variable of interest is working capital accruals (*WCACC*). We focus on working capital accruals because, relative to total accruals, they primarily reflect managerial estimation and projection about near-term earnings (e.g., stock inventory in anticipation of improving market demand for the next year) as opposed to long-term earnings growth (e.g., increase plant investments to expand production capacity in anticipation of sustained future growth). Thus, future earnings implications of working capital accruals are better aligned with the forecasting horizon of managers' one-year-ahead earnings forecasts. In H1, we predict a positive relation between management earnings forecast errors and accruals, i.e., $\beta > 0$.

We control for various factors that could affect management earnings forecast errors and potentially confound the association between management forecast errors and accruals in Equation (1). First, prior research suggests that managers of poorly performing firms or financially distressed firms have greater incentives to provide optimistic earnings forecasts to support market earnings expectations (e.g., Frost 1997; Koch 2002; Rogers and Stocken 2005; Rogers and Buskirk 2006). Firms' operating performance also directly affects the level of accruals through the accrual accounting system. We thus include return-on-assets (*ROA*), current year earnings surprises (*ESURP*), and Altman's Z-score (*AltmanZ*) to control for the potential impacts of firm performance and distress risk on managers' forecast errors and accruals.

Second, industry competition could motivate managers to hide firm profitability, possibly via pessimistic earnings forecasts (Newman and Sansing 1993). We thus include industry concentration ratio (*IndCon*) to control for this effect. Third, we control for external financing (*XFIN*) in the regression since external financing has been proposed as an important factor that might induce managerial optimism in forecasting earnings (e.g., Frankel et al. 1995; Lang and Lundholm 2000) as well as earnings inflation through income-increasing abnormal accruals (e.g., Teoh et al. 1998a, 1998b), although empirical findings concerning these conjectures are still mixed. Fourth, incentives to maximize potential gains from trading the firm's securities could induce managers to issue biased earnings forecasts (Aboody and Kasznik 2000; Noe 1999; Rogers and Stocken 2005). We thus control for insider trading (*TRADE*) in the regression. Fifth, we include an indicator variable identifying litigious industries (*LITIGATION*) since the litigation environment affects managers' incentives to intentionally bias voluntarily disclosed information (e.g., Skinner 1994, 1997;

Baginski et al. 2002; Rogers and Stocken 2005). Sixth, McNichols (1989) finds a significantly negative relation between management forecast errors and past stock returns, which suggests that management earnings forecasts do not fully reflect information contained in historical stock prices. We thus control for past stock returns (*RETURN*) in the regression.

We add several additional control variables related to the general information environment that might affect the cost-benefit trade-off of issuing biased management earnings forecasts. We control for firm size (*MV*) and analyst coverage (*NANALYSTS*) since larger firms and firms followed by a larger number of analysts generally face greater public scrutiny and thus have greater incentives to avoid excessive errors in management earnings forecasts (e.g., Baginski et al. 2002). We also control for firm growth (*BM*) since the valuation of high-growth firms largely hinges on expected future cash flows (rather than the value of assets in place), which intensifies the market demand and public scrutiny for forward-looking information disclosures. In this case, managers might have incentives to forecast optimistically to "hype the stock," but optimistic forecasts are potentially more costly due to heightened litigation risks and public attention. Moreover, as we argued in Section III, uncertainty in the operating environment necessarily generates errors in managers' business assessments. We thus include cash flow volatility (*CFOVOL*), sales growth volatility (*SALESGRVOL*), and operating cycle (*OPCYCLE*) to control for operating environment uncertainty. Finally, we include fixed year effects to control for temporal changes in management earnings forecast errors. To mitigate the influences of outliers and errors in the data, we winsorize the top and bottom one-percentiles of the regression variables (except *IndCon*, *LITIGATION*, and *NANALYSTS*). Variables *CFOVOL*, *SALESGRVOL*, and *OPCYCLE* are winsorized at the top one-percentile only.

V. EMPIRICAL RESULTS

Descriptive Statistics

Panel A of Table 2 outlines the descriptive statistics for our sample of 4,443 firm-years. Consistent with prior studies showing optimistic biases in management earnings forecasts issued early-in-the-year (e.g., Choi and Ziebart 2004), we find that the average management forecast errors (*MFE*) is significantly positive at 0.006. As also shown in the table, the average working capital accruals (*WCACC*) and total accruals (*TACC*) are 0.014 and −0.059 respectively. Possibly due to First Call's coverage biases, our sample contains relatively large firms with mean (median) market capitalization (*MV*) of \$5,241 million (\$1,082 million).

Panel B of Table 2 contains pairwise correlations between management forecast errors, accruals, and other regression variables in Equation (1). We find that management forecast errors are positively correlated with working capital accruals (Pearson correlation = 0.129) and total accruals (Pearson correlation = 0.092), suggesting that managers who report relatively high (low) accruals tend to issue more optimistic (pessimistic) forecasts of subsequent year earnings. In addition, the correlations between working capital accruals and other regression variables are modest (correlations are mostly less than 0.1 in magnitude), suggesting that multicollinearity concern is unlikely to affect our empirical inferences.

Univariate Analysis on the Relation between Management Forecast Errors and Accruals

Table 3 presents the mean and median of management earnings forecast errors (*MFE*) across deciles portfolios of working capital accruals (*WCACC*). As shown, the mean (median) value of *MFE* increases from 0.001 (−0.002) for the lowest *WCACC* decile to 0.015 (0.003) for the highest *WCACC* decile. The difference in the mean (median) *MFE* between

TABLE 2
Descriptive Statistics and Correlation Matrix

Panel A: Descriptive Statistics (n = 4,443)

Variable	Mean	Standard Deviation	Lower Quartile	Median	Upper Quartile
MFE_{t+1}	0.006	0.038	−0.006	0.000	0.011
$WCACC_t$	0.014	0.062	−0.015	0.007	0.035
$TACC_t$	−0.059	0.081	−0.093	−0.052	−0.021
ROA_t	0.062	0.104	0.030	0.062	0.106
$ESURP_t$	0.001	0.029	0.000	0.001	0.003
$AltmanZ_t$	5.292	5.195	2.439	3.790	6.081
$IndCon_t$	0.234	0.183	0.103	0.190	0.313
$XFIN_{t+1}$	0.022	0.269	−0.059	−0.009	0.034
$TRADE_t$	−0.013	0.181	0.000	0.000	0.000
$LITIGATION_t$	0.305	0.460	0.000	0.000	1.000
$RETURN_t$	0.189	0.609	−0.154	0.073	0.356
MV_t	5,241	13,104	384	1,082	3,669
$NANALYSTS_t$	7.265	6.615	2.000	6.000	11.000
BM_t	0.461	0.342	0.239	0.382	0.590
$CFOVOL_t$	0.874	1.633	0.237	0.410	0.788
$SALESGRVOL_t$	2.550	5.763	0.644	1.073	1.969
$OPCYCLE_t$	114.174	72.560	64.946	99.000	144.391

(continued on next page)

TABLE 2 (continued)

Panel B: Correlations among Regression Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) MFE_{t+1}		**0.129**	**0.092**	**−0.051**	**−0.118**	**−0.055**	0.013	−0.026	−0.007	0.019	**−0.145**	**−0.059**	**−0.090**	**0.224**	**0.071**	−0.004	0.026
(2) $WCACC_t$	**0.153**		**0.633**	**0.082**	**0.054**	**0.107**	0.029	**0.045**	**0.027**	**−0.062**	−0.001	**−0.033**	**−0.046**	**−0.034**	**0.123**	**−0.043**	**0.110**
(3) $TACC_t$	**0.115**	**0.641**		**0.343**	**0.145**	0.003	**0.058**	−0.020	0.009	**−0.110**	−0.025	0.018	**−0.051**	0.028	**0.098**	0.002	**0.151**
(4) ROA_t	**−0.059**	**0.078**	**0.152**		**0.199**	**0.283**	**0.050**	**−0.125**	**0.067**	**−0.030**	**0.134**	**0.120**	**0.103**	**−0.273**	**−0.049**	**−0.055**	0.006
(5) $ESURP_t$	**−0.162**	**−0.020**	**0.036**	**0.131**		**0.024**	0.010	**0.035**	0.022	0.010	**0.133**	**−0.011**	**−0.022**	**−0.108**	0.002	−0.026	**−0.038**
(6) $AltmanZ_t$	**−0.032**	**0.053**	−0.019	**0.572**	0.027		−0.027	**0.063**	**0.063**	**0.178**	**0.205**	**0.060**	**0.056**	**−0.332**	**0.078**	**−0.105**	**0.096**
(7) $IndCon_t$	0.005	**0.055**	**0.067**	**0.077**	0.020	**0.082**		−0.009	−0.013	**−0.214**	0.001	0.021	**−0.101**	0.003	**−0.032**	**−0.015**	**0.031**
(8) $XFIN_{t+1}$	0.012	**0.104**	**0.033**	**−0.110**	**0.076**	−0.004	**−0.047**		0.028	**0.040**	**0.123**	**−0.088**	**−0.101**	**−0.042**	**0.120**	−0.027	−0.010
(9) $TRADE_t$	**−0.048**	**0.022**	−0.013	**0.104**	**0.075**	**0.115**	0.008	**0.055**		−0.010	**0.076**	**−0.063**	**−0.050**	**−0.017**	0.014	−0.014	−0.029
(10) $LITIGATION_t$	0.017	**−0.075**	**−0.113**	**0.049**	−0.005	**0.240**	**−0.237**	**0.052**	0.008		0.022	**0.096**	**0.168**	**−0.093**	**0.055**	−0.024	0.024
(11) $RETURN_t$	**−0.173**	**−0.071**	**−0.062**	**0.157**	**0.206**	**0.140**	0.008	**0.089**	**0.100**	**−0.020**		**−0.054**	**−0.097**	**−0.230**	**0.095**	−0.021	−0.028
(12) MV_t	**−0.132**	**−0.076**	−0.003	**0.188**	**−0.094**	0.002	**−0.041**	**−0.222**	**−0.052**	−0.009	0.025		**0.524**	**−0.212**	**−0.084**	−0.004	**0.090**
(13) $NANALYSTS_t$	**−0.074**	**−0.035**	**−0.042**	**0.133**	**−0.176**	**0.046**	**−0.111**	**−0.107**	−0.018	**0.130**	**−0.061**	**0.692**		**−0.252**	**−0.112**	**−0.044**	−0.007
(14) BM_t	**0.159**	−0.021	**0.087**	**−0.481**	**−0.021**	**−0.442**	**−0.018**	**0.059**	**−0.090**	**−0.126**	**−0.259**	**−0.382**	**−0.260**		**0.062**	**0.042**	−0.025
(15) $CFOVOL_t$	**0.073**	**0.149**	**0.131**	**−0.171**	**0.068**	**0.057**	−0.020	**0.206**	0.018	**0.090**	**0.045**	**−0.439**	**−0.258**	**0.110**		−0.007	**0.080**
(16) $SALESGRVOL_t$	**−0.026**	**−0.057**	**0.022**	**−0.301**	**0.036**	**−0.337**	−0.015	**−0.065**	**−0.074**	**−0.141**	0.015	**−0.045**	**−0.136**	**0.185**	**0.092**		**0.044**
(17) $OPCYCLE_t$	**0.061**	**0.115**	**0.194**	0.018	**−0.045**	**0.080**	**0.116**	**−0.022**	**−0.070**	0.010	−0.032	−0.007	**−0.083**	**−0.016**	**0.090**	**0.084**	

Panel A presents descriptive statistics for the sample.All variable are winsorized at top and bottom one-percentiles except *IndCon*, *LITIGATION*, and *NANALYSTS*. Variables *CFOVOL*, *SALESGRVOL*, and *OPCYCLE* are winsorized at the top one-percentile only.

Panel B presents Pearson correlations (above diagonal) and Spearman correlations (below diagonal) between management forecast biases, accruals, and other regression variables. Bold figures indicate significance levels at less than 1 percent. All variables are defined in the Appendix.

TABLE 3
Univariate Relation between Management Earnings Forecast Errors and Accruals

	Across $WCACC_t$ Ranks		Across $TACC_t$ Ranks	
Decile Ranks of $WCACC_t$ or $TACC_t$	Mean MFE_{t+1} (%Positive)	Median MFE_{t+1}	Mean MFE_{t+1} (%Positive)	Median MFE_{t+1}
Lowest	0.001 (39%)	−0.002	0.000 (44%)	−0.001
2	0.003 (42%)	−0.002	0.004 (43%)	−0.001
3	0.004 (44%)	−0.001	0.005 (45%)	0.000
4	0.006 (46%)	0.000	0.004 (45%)	0.000
5	0.005 (48%)	0.000	0.004 (45%)	0.000
6	0.005 (50%)	0.000	0.006 (48%)	0.000
7	0.004 (51%)	0.000	0.006 (52%)	0.001
8	0.007 (53%)	0.001	0.008 (54%)	0.001
9	0.010 (58%)	0.003	0.008 (55%)	0.002
Highest	0.015 (60%)	0.003	0.014 (59%)	0.003
Highest − Lowest	0.014***	0.005***	0.014***	0.004***
[p-value]	[0.000]	[0.000]	[0.000]	[0.000]

*** Indicates significance level at less than 1 percent based on two-tailed t-tests (z-tests) on the mean (median) difference in *MFE* across the highest and the lowest accrual deciles. The sample period is from 1996 to 2006.

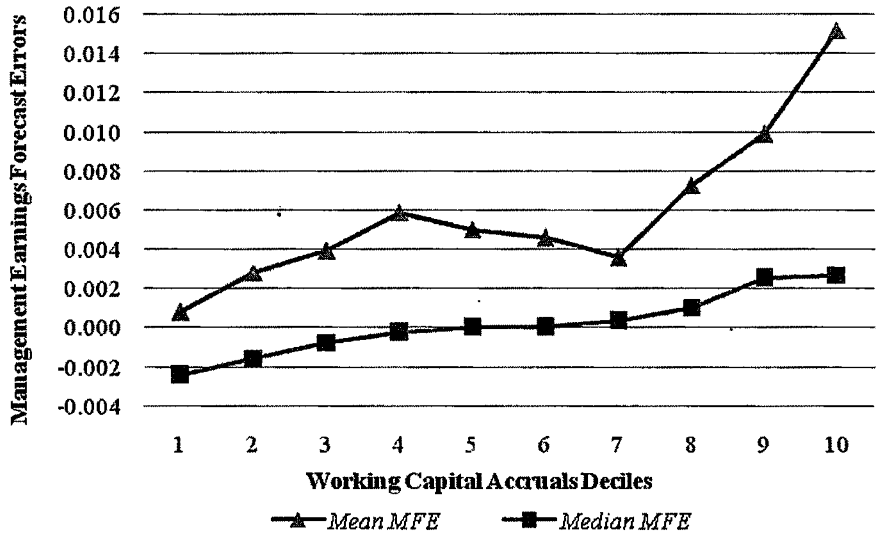
This table reports the mean and median of management earnings forecast errors (*MFE*) across deciles of working capital accruals (*WCACC*) and total accruals (*TACC*). The percentage of optimistic management earnings forecasts (%Positive) are reported in parentheses. See the Appendix for variable definitions.

the highest and lowest *WCACC* deciles is statistically significant at the <0.01 (0.01) level based on a two-tailed t-test (z-test). To put these numbers into perspective, with a price-to-earnings ratio of 12 (the sample median), the mean management forecast errors in the lowest and highest *WCACC* deciles amount to 1.2 percent and 18 percent of reported earnings, respectively. The positive relation between *MFE* and *WCACC* is also transparent as illustrated in Figure 1.

As a robustness check, we also examine the mean and median of *MFE* across deciles of total accruals (*TACC*). We measure total accruals as the difference between income before extraordinary items (#123) and operating cash flows (#308 − #124), deflated by lagged total assets (#6). Our findings are also reported in Table 3. Similar to the results based on *WCACC*, the mean and median *MFE* increase with the level of *TACC*. In summary, the univariate results in Table 3 provide initial evidence that managers reporting relatively high (low) accruals tend to issue more (less) optimistically biased forecasts of subsequent year earnings.

FIGURE 1

Management Earnings Forecast Errors across Working Capital Accruals Deciles



This figure presents mean and median management forecast errors (*MFE*) across deciles of working capital accruals (*WCACC*). *MFE* and *WCACC* are defined in the Appendix. Firm-year observations are ranked annually and assigned in equal numbers to decile portfolios based on *WCACC*. The sample has 4,443 firm-years for which *MFE*, *WCACC*, and control variables in Equation (1) are available from the Compustat, CRSP, and First Call's Company Issued Guidance (CIG) databases. The sample period is from 1996 to 2006.

Multivariate Analysis on the Relation between Management Forecast Errors and Accruals

Table 4 presents the multivariate regression results from estimating Equation (1). As shown, the coefficient on *WCACC* is significantly positive (Coefficient = 0.068, t = 5.73), consistent with earlier univariate findings that management forecasts are relatively more optimistic (pessimistic) following periods of high (low) accruals. The effect of *WCACC* on management forecast errors is not only statistically significant, but also economically significant. With a price-to-earnings ratio of 12 (the sample median), a 1 percent increase in working capital accruals (as a percentage of total assets) would increase the errors in management forecasts by about 0.82 percent of reported earnings (i.e., 12 × 0.068 × 1 = 0.82). Results also show that this positive coefficient remains highly significant (Coefficient = 0.009, t = 4.93) when we measure *WCACC* using scaled decile rank ($WCACC^R$).[13]

As a robustness check, we again examine the relation between management forecast errors and total accruals after controlling for other factors that also affect management forecast errors. As reported in the last two columns of Table 4, the coefficient on *TACC* is significantly positive (Coefficient = 0.043, t = 4.88), as is the coefficient on $TACC^R$, the scaled decile rank of *TACC* (Coefficient = 0.008, t = 3.83). Overall, results reported in

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[13] In untabulated results, we find that management earnings forecast errors exhibit significantly positive relations with each major component of working capital accruals (including changes in receivable, changes in inventory, changes in accounts payable, and other working capital accruals).

TABLE 4
Multivariate Regressions of Management Earnings Forecast Errors on Accruals

	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
$WCACC_t$	0.068*** (5.73)			
$WCACC_t^R$		0.009*** (4.93)		
$TACC_t$			0.043*** (4.88)	
$TACC_t^R$				0.008*** (3.83)
ROA_t	0.021*** (2.72)	0.022*** (2.94)	0.011 (1.39)	0.018** (2.35)
$ESURP_t$	−0.121*** (−3.32)	−0.118*** (−3.22)	−0.125*** (−3.43)	−0.119*** (−3.25)
$AltmanZ_t$ × 1000	−0.192* (−1.72)	−0.165 (−1.48)	−0.090 (−0.81)	−0.120 (−1.07)
$IndCon_t$	0.005 (1.46)	0.005 (1.49)	0.005 (1.46)	0.005 (1.48)
$XFIN_{t+1}$	−0.003 (−1.11)	−0.003 (−1.11)	−0.003 (−1.11)	−0.003 (−1.09)
$TRADE_t$	−0.002 (−0.88)	−0.002 (−0.85)	−0.002 (−0.77)	−0.002 (−0.74)
$LITIGATION_t$	0.004*** (3.11)	0.004*** (2.98)	0.004*** (2.92)	0.004*** (2.85)
$RETURN_t$	−0.008*** (−6.77)	−0.008*** (−6.80)	−0.008*** (−6.77)	−0.008*** (−6.86)
$\ln(MV_t)$	−0.002*** (−3.93)	−0.003*** (−4.06)	−0.003*** (−4.59)	−0.003*** (−4.59)
$NANALYSTS_t$ × 1000	0.040 (0.39)	0.049 (0.47)	0.108 (1.05)	0.096 (0.93)
BM_t	0.015*** (4.23)	0.015*** (4.18)	0.013*** (3.72)	0.013*** (3.78)
$CFOVOL_t$ × 1000	0.860* (1.81)	0.995** (2.04)	0.872* (1.80)	0.968** (1.97)
$SALESGRVOL_t$ × 1000	−0.009 (−0.10)	−0.015 (−0.17)	−0.030 (−0.34)	−0.027 (−0.31)
$OPCYCLE_t$ × 1000	0.005 (0.50)	0.006 (0.61)	0.003 (0.33)	0.005 (0.47)
Intercept	0.012 (1.14)	0.011 (1.01)	0.021* (1.89)	0.015 (1.38)
Year Fixed Effect	Included	Included	Included	Included
Adjusted R^2	0.128	0.123	0.124	0.121
n	4,443	4,443	4,443	4,443

(*continued on next page*)

TABLE 4 (continued)

***, **, * Indicate significance level at less than 1 percent, 5 percent, and 10 percent, respectively, based on two-tailed t-tests. The sample period is from 1996 to 2006.

This table reports ordinary least squares regression results of management forecast errors (*MFE*) on working capital accruals (*WCACC*) or total accruals (*TACC*). See the Appendix for variable definitions. When estimating the coefficients' standard errors, we use a clustering procedure that accounts for serial dependence across years of a given firm. t-statistics are presented in parentheses. For ease of exposition, coefficients on *AltmanZ*, *NANALYSTS*, *CFOVOL*, *SALESGRVOL*, and *OPCYCLE* are multiplied by 1000.

Table 4 provide strong evidence that management earnings forecast errors are positively related to both working capital accruals and total accruals, supporting H1.

Turning to control variables, we find a significantly positive coefficient on operating performance (*ROA*), suggesting that managers appear to over-extrapolate past performance in forecasting future earnings.[14] We also observe that management earnings forecasts are more optimistic when earnings surprises for the current period (*ESURP*) are more negative, consistent with recent evidence that managers bundle negative earnings surprises with optimistic earnings forecasts to support market earnings expectations (Rogers and Buskirk 2006). In addition, we document a significantly positive coefficient on *LITIGATION*, suggesting that managers in litigious industries on average display greater optimism in forecasting earnings.[15] We also find that past stock returns (*RETURN*) are negatively related with management forecast errors, consistent with McNichols's (1989) finding that management earnings forecasts do not fully incorporate information in prior stock prices. Furthermore, the coefficients on ln(*MV*) and *BM* are significantly negative and positive, respectively, suggesting that large firms and high-growth firms tend to forecast more conservatively in our sample. Finally, firms with more volatile cash flows from operations (*CFOVOL*) tend to forecast more optimistically.[16]

Influence of Operating Uncertainty on the Relation between Management Forecast Errors and Accruals

We predict in H2 that the positive relation between management forecast errors and accruals is stronger for firms operating in an uncertain business environment than firms operating in a stable business environment. To test this hypothesis, we measure uncertainty in the operating environment based on three alternative proxies: cash flow volatility (*CFOVOL*), sales growth volatility (*SALESGRVOL*), and operating cycle (*OPCYCLE*). These proxies are intended to capture multiple aspects of operating uncertainty. In particular, volatility in operating cash flows potentially originates from unstable market conditions that affect a firm's cash flow generating abilities; sales growth volatility largely reflects temporal fluctuations in customer demand; and the length of operating cycle depends on the firm's production function and business model. Collectively, these measures parsimoniously capture the inherent uncertainty in measuring accruals and forecasting earnings. As shown in Panel B of Table 2, the correlations among these measures are fairly low (all below 0.1 in magnitude), consistent with the idea that these variables reflect different dimensions of operating uncertainty.

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[14] Our observed positive relation between management earnings forecast errors and accruals could be confounded by managers' over-extrapolation of realized performance in forecasting earnings because high (low) accruals could result from superior (poor) economic performance and a neutral application of accounting rules, rather than managers' proactive choices that aim to convey their personal assessments about firms' business prospects. To further ensure that our results are not driven by managers' extrapolation of past economic performance, we identify cases where accruals are *least* likely driven by concurrent firm performance. Specifically, we select firms ranked in the top (bottom) quintile of *WCACC* but ranked in the bottom (top) quintile of *ROA*, and re-estimate Equation (1) for these firms. Untabulated results show a significantly positive coefficient on $WCACC^R$ (Coefficient = 0.022, t = 2.23), suggesting that over-extrapolation of past performance unlikely fully explain the positive association between management forecast errors and accruals.

[15] This finding seems inconsistent with the deterrence effect of litigation on optimistic management forecasts. One possibility is that litigation concern is more relevant for management forecasts issued shortly before the earnings announcement (see Soffer et al. 2000), but we focus on management forecasts issued early in the year.

[16] Kasznik (1999) suggests that managers use positive discretionary accruals to manage reported earnings upward to minimize optimistic errors in management earnings forecasts. We re-estimate Equation (1) after including discretionary accruals (based on cross-sectional Modified Jones' Model) as an additional explanatory variable. Similar to Rogers and Stocken (2005), we find an insignificant coefficient on year $t+1$ discretionary accruals (untabulated). The coefficient on working capital accruals (*WCACC*) or total accruals (*TACC*) remains significantly positive.

Table 5 reports regression results for Equation (1) across subsamples of firms ranked in the top, middle, and bottom terciles of each operating uncertainty proxy. For firms ranked in the bottom tercile of *CFOVOL*, the coefficient on $WCACC^R$ is significantly positive (Coefficient = 0.006, t = 2.31). Moving to the subsample ranked in the top tercile of *CFOVOL*, the magnitude of the coefficient on $WCACC^R$ is doubled (Coefficient = 0.012, t = 3.25). This coefficient difference between the top and bottom subsamples is statistically significant at the <0.01 level based on a two-tailed F-test. Similarly, we find that the coefficient on $WCACC^R$ is significantly more positive for firms ranked in the top tercile of *SALESGRVOL* or *OPCYCLE* than firms ranked in the bottom tercile of *SALESGRVOL* or *OPCYCLE*.

As a robustness check, we also examine how the positive relation between management forecast errors and total accruals varies with the level of operating uncertainty. Untabulated results show that the positive relation between management forecast errors (*MFE*) and the scaled decile rank of total accruals ($TACC^R$) is significantly stronger for subsample firms ranked in the top tercile of *CFOVOL*, *SALESGRVOL*, or *OPCYCLE*, respectively, than their bottom-tercile counterparts. These results are consistent with the conjecture that managers who cope with a more uncertain operating environment make greater errors in assessing the firm's business prospects and generating accruals, thus strengthening the positive relation between management forecast errors and accruals.

Influence of Accrual-Growth Covariation on the Relation between Management Forecast Errors and Accruals

We predict in H3 that the positive relation between management forecast errors and accruals is stronger when accruals highly covary with growth-related activities that reflect managerial projections about firms' business prospects. We use growth in the number of employees to capture managers' projections about firms' business prospects (Zhang 2007). Employee growth reflects managers' growth expectations as revealed through human capital investment decisions, and is free of any biases in the financial reporting system.[17] Similar to Zhang (2007), we categorize industries based on the covariation of accruals with growth in the number of employees. Specifically, for each year, we regress *WCACC* on concurrent employee growth within each Fama-French 48-industry classification. The coefficient on employee growth represents the extent to which accruals covary with concurrent

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[17] Zhang (2007) argues that growth in the number of employees is a better measure for firm growth than conventional growth measures based on financial information (such as market-to-book, growth in cash sales, growth in total assets, etc.) because employee growth is a nonaccounting-based variable and, therefore, is free of any measurement error or discretionary choices inherent in the accounting system.

TABLE 5
Multivariate Regressions of Management Earnings Forecast Errors on Working Capital Accruals Conditional on the Level of Uncertainty in the Operating Environment

	Low *CFOVOL*	Moderate *CFOVOL*	High *CFOVOL*
	Coefficient (t-statistic)	**Coefficient (t-statistic)**	**Coefficient (t-statistic)**
$WCACC_t^R$	0.006** (2.31)	0.006** (2.34)	0.012*** (3.25)
Control Variables	Included	Included	Included
Coefficient difference in $WCACC_t^R$ between: High *SALESGRVOL* versus Low *SALESGRVOL* [Two-tailed p-value]			0.006 [0.000]
Adjusted R^2	0.124	0.141	0.135
n	1,477	1,485	1,481

	Low *SALESGRVOL*	**Moderate *SALESGRVOL***	**High *SALESGRVOL***
	Coefficient (t-statistic)	**Coefficient (t-statistic)**	**Coefficient (t-statistic)**
$WCACC_t^R$	0.009*** (3.17)	0.006* (1.90)	0.012*** (3.39)
Control Variables	Included	Included	Included
Coefficient difference in $WCACC_t^R$ between: High *CFOVOL* versus Low *CFOVOL* [Two-tailed p-value]			0.003 [0.000]
Adjusted R^2	0.144	0.124	0.153
n	1,477	1,485	1,481

(continued on next page)

TABLE 5 (continued)

	Low *OPCYCLE*	Moderate *OPCYCLE*	High *OPCYCLE*
	Coefficient (t-statistic)	**Coefficient (t-statistic)**	**Coefficient (t-statistic)**
$WCACC_t^R$	0.004 (1.42)	0.011*** (3.51)	0.012*** (3.41)
Control Variables	Included	Included	Included
Coefficient difference in $WCACC_t^R$ between:			
High *OPCYCLE* versus Low *OPCYCLE* [Two-tailed p-value]			0.008 [0.000]
Adjusted R^2	0.105	0.169	0.131
n	1,477	1,485	1,481

***, **, * Indicate significance level at less than 1 percent, 5 percent, 10 percent, respectively, based on two-tailed t-tests. The sample period is from 1996 to 2006.

This table reports ordinary least squares regression results of management forecast errors (*MFE*) on the scaled decile rank of working capital accruals ($WCACC^R$) conditional on the level of operating uncertainty. The Low/Moderate/High subsamples include firm-years ranked in the bottom/middle/top tercile of each operating uncertainty proxy (*CFOVOL*, *SALESGRVOL*, and *OPCYCLE*). See the Appendix for variable definitions. When estimating the coefficients' standard errors, we use a clustering procedure that accounts for serial dependence across years of a given firm. Coefficients on control variables and year fixed effect are not reported for brevity. t-statistics are presented in parentheses and two-tailed p-values based on F-tests are presented in brackets.

employment decisions. We then rank industries based on the average covariation between accruals and employee growth over our sample period (*COV_ACCREMPGR*).[18]

Panel A of Table 6 provides summary statistics for *COV_ACCREMPGR*. As shown, the inter-industry variation in this variable is large, ranging from 0.009 in the lower quartile to 0.074 in the upper quartile. Panel B of Table 6 reports regression results for Equation (1) across industries ranked in the top, middle, and bottom terciles of *COV_ACCREMPGR*. Results show that the relation between management forecast errors (*MFE*) and the scaled decile rank of working capital accruals ($WCACC^R$) is insignificant for industries exhibiting the lowest covariations between working capital accruals and employee growth (Coefficient = 0.001, t = 0.30). In contrast, for industries in which working capital accruals covary strongly with employee growth, the coefficient on $WCACC^R$ is significantly positive (Coefficient = 0.012, t = 3.48). This coefficient difference between these two subsamples is statistically significant at the <0.01 level based on a two-tailed F-test.

We similarly construct the accrual-employee growth covariation based on total accruals (*COV_TACCREMPGR*). Untabulated results show that the association between management forecast errors (*MFE*) and the scaled decile rank of totals accruals ($TACC^R$) is statistically insignificant for industries ranked among the bottom tercile of *COV_TACCREMPGR*, whereas this association is significantly positive for industries ranked in the top tercile of *COV_TACCREMPGR*. These results provide additional support to the conjecture that managerial misassessments of business prospects, which manifest in both accruals and management earnings forecasts, contribute to the positive relation between management forecast errors and accruals.

Intentional Misrepresentation as an Alternative Explanation

While we have proposed that the positive association between management earnings forecast errors and accruals is caused by managers' unintentional errors in assessing firms' business prospects, this positive association could also arise from managers' intentional misrepresentation of their earnings forecasts and accruals. To distinguish between these two explanations, we examine the implications of insider trading on the association between management earnings forecast errors and accruals.

We measure insider trading based on net acquisition/disposition of stocks and options by the top five executives (CEO, Chairman, CFO, COO, and Vice President) during the one-month period following the management earnings forecasts. Under the unintentional misassessment explanation, H4a predicts that the positive association between management forecast errors and accruals is stronger when managers purchase (sell) shares following periods of high (low) accruals. Under the alternative intentional misrepresentation explanation, H4b predicts that the positive association between management forecast errors and accruals is stronger when managers sell (purchase) shares following periods of high (low) accruals. We thus form two subsamples of firms to test these hypotheses. Sample A consists of firm-years ranked in the top (bottom) quintile of *WCACC* and with managers' share purchases (sales) subsequent to management forecasts. Sample B includes firm-years ranked in the top (bottom) quintile of *WCACC* and with managers' share sales (purchases) following management forecasts. We expect Sample A to represent cases where the level

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[18] As expected, retailers, wholesalers, and manufacturers tend to have high covariation between accruals and employee growth. For example, the five industries with the highest values of *COV_ACCREMPGR* include Tobacco Products, Wholesale, Chemicals, Machinery, and Fabricated Products. On the other extreme, service and agriculture production industries often have low accrual-growth covariation. In particular, Trading, Coal, Entertainment, Insurance, and Agriculture are among the industries exhibiting the lowest covariation between accruals and employee growth.

TABLE 6

Multivariate Regressions of Management Earnings Forecast Errors on Working Capital Accruals Conditional on the Covariation between Working Capital Accruals and Employee Growth

Panel A: Descriptive Statistics of the Industry-Level Covariance between Working Capital Accruals and Employee Growth (*COV_ACCREMPGR*)

Variable	Mean	Standard Deviation	Lower Quartile	Median	Upper Quartile	n
COV_ACCREMPGR	0.041	0.046	0.009	0.041	0.074	48

Panel B: Subsample Regression Results

	Low *COV_ACCREMPGR* Coefficient (t-statistic)	Moderate *COV_ACCREMPGR* Coefficient (t-statistic)	High *COV_ACCREMPGR* Coefficient (t-statistic)
$WCACC_t^R$	0.001 (0.30)	0.009*** (3.37)	0.012*** (3.48)
Control Variables	Included	Included	Included
Coefficient difference in $WCACC_t^R$ between: High *COV_ACCREMPGR* versus Low *COV_ACCREMPGR* [Two-tailed p-value]			0.011 [0.000]
Adjusted R^2	0.132	0.128	0.176
n	991	2,179	1,273

*** Indicate significance level at less than 1 percent, based on two-tailed t-tests. The sample period is from 1996 to 2006.

Panel A presents summary statistics of the industry-level covariation between accruals and employee growth (*COV_ACCREMPGR*). We regress working capital accruals (*WCACC*) on concurrent employee growth within each Fama-French 48-industry classification for each year. The coefficient on employee growth represents the covariation between accruals and employee growth. *COV_ACCREMPGR* is measured as the average covariation between accruals and employee growth for each industry over the sample period.

Panel B reports ordinary least squares regression results of management forecast errors (*MFE*) on the scaled decile rank of working capital accruals ($WCACC^R$) conditional on the industry-level *COV_ACCREMPGR*. The Low/Moderate/High *COV_ACCREMPGR* subsample include firm-years ranked in the bottom/middle/top tercile of *COV_ACCREMPGR*. See the Appendix for the other variable definitions. When estimating the coefficients' standard errors, we use a clustering procedure that accounts for serial dependence across years of a given firm. Coefficients on control variables and year fixed effect are not reported for brevity. t-statistics are presented in parentheses and two-tailed p-values based on F-tests are presented in brackets.

of accruals more likely reflects managers' personal beliefs about future firm performance, and Sample B to identify cases where accruals are more likely manipulated to boost managers' trading profitability.

Table 7 reports regression results for Equation (1) for Samples A and B. As shown, for Sample A where accruals more likely reflect managers' true beliefs about future firm performance, the coefficient on $WCACC^R$ is significantly positive (Coefficient = 0.013, t = 2.55). In contrast, the coefficient on $WCACC^R$ is insignificant (Coefficient = −0.000, t = −0.02) for Sample B where accruals are more likely manipulated to boost trading gains. The difference in the coefficient on $WCACC^R$ between Samples A and B is significant at the <0.10 level. These results do not support the conjecture that managerial self-serving incentives lead to intentional misrepresentation in managers' multiple information disclosures such as accruals and earnings forecasts. On the contrary, they support the unintentional misassessment explanation.

In untabulated sensitivity checks, we find that the relation between management forecast errors (*MFE*) and the decile rank of total accruals ($TACC^R$) is significantly positive when total accruals are likely to reflect managers' true beliefs about future firm performance (i.e., top/bottom quintile of total accruals followed by share purchases/sales), but is statistically insignificant when total accruals are likely manipulated to boost managers' trading gains (i.e., top/bottom quintile of total accruals followed by share sales/purchases). However, the difference in the coefficient on $TACC^R$ between these two subsamples is not significant at conventional levels (two-tailed p-value = 0.151).[19]

VI. THE INFLUENCE OF MANAGEMENT EARNINGS FORECASTS ON ACCRUAL MISPRICING

Prior literature generally advocates voluntary disclosure as a valuable source of information that helps reduce mispricing of mandated reported accounting information (e.g., Kimbrough 2005; Louis et al. 2008; Drake et al. 2008).[20] Given our findings that management forecasts contain an accrual-related bias, it is *ex ante* unclear whether *biased* management earnings forecasts are able to facilitate more efficient pricing of accruals information. On the one hand, managers' optimistic (pessimistic) forecasts following periods of high (low) accruals might exacerbate investors' over-reaction to accruals. On the other hand, the accrual-related biases embedded in management earnings forecasts might be less severe than those embedded in investors' earnings expectations, which implies that management earnings forecasts could help reduce accrual mispricing. Finally, investors are found to under-react to management earnings forecasts (Ng et al. 2008), which potentially weakens the impact of management earnings forecasts on accrual pricing.

One issue that has to be dealt with before examining the effect of management earnings forecasts on accrual mispricing is the endogenous nature of management earnings forecasts.

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[19] To further corroborate our findings, we examine insider trading activities for firm-years that drive the positive association between management forecast errors and accruals. Specifically, we select firm-years ranked in the top (bottom) quintile of *WCACC* that also issued optimistic (pessimistic) earnings forecasts. Untabulated results show that when top quintile accruals are followed by optimistic management forecasts, a majority (54 percent) of top management groups purchase, as opposed to sell, shares. On the other hand, when bottom quintile accruals are followed by pessimistic management forecasts, a majority (55 percent) of top management groups chooses to sell, rather than purchase, shares. These results again are inconsistent with managers' intentional manipulation of accruals and earnings forecasts to enhance trading profitability, but are consistent with the unintentional misassessment explanation.

[20] Kimbrough (2005) shows that the initiation of conference calls reduces post-earnings-announcement drift. Louis et al. (2008) find that firms voluntarily providing accruals information at earnings announcement experience less accrual mispricing. Drake et al. (2008) also find that firms with overall higher disclosure quality (measured by analyst ratings published by AIMR) experience less accrual mispricing.

TABLE 7
Multivariate Regressions of Management Earnings Forecast Errors on Working Capital Accruals Conditional on Insider Trading

	Sample A (Top/Bottom Quintile of *WCACC* followed by Net Purchases/Sales)	Sample B (Top/Bottom Quintile of *WCACC* followed by Net Sales/Purchases)
	Coefficient (t-statistic)	Coefficient (t-statistic)
$WCACC_t^R$	0.013**	−0.000
	(2.55)	(−0.02)
Control Variables	Included	Included
Coefficient difference in $WCACC_t^R$ between:		
Sample A versus Sample B		0.013
[Two-tailed p-value]		[0.074]
Adjusted R^2	0.204	0.121
n	360	375

** Indicate significance level at less than 5 percent, based on two-tailed t-tests. The sample period is from 1996 to 2006.

This table reports ordinary least squares regression results of management forecast errors (*MFE*) on the scaled decile rank of working capital accruals ($WCACC^R$) conditional on insider trading activities. Sample A consists of firm-years with accruals ranked in the top (bottom) quintile of *WCACC* and with managers' share purchases (sales) following management forecasts. Sample B consists of firm-years ranked in the top (bottom) quintile of *WCACC* and with managers' share sales (purchases) following management forecasts. See the Appendix for variable definitions. When estimating the coefficients' standard errors, we use a clustering procedure that accounts for serial dependence across years of a given firm. Coefficients on control variables and year fixed effect are not reported for brevity. t-statistics are presented in parentheses and two-tailed p-values based on F-tests are presented in brackets.

In particular, managers could choose to make earnings forecasts when the magnitude of accruals is large and accrual mispricing is more severe. We follow Heckman's (1979) two-stage approach to control for this potential self-selection bias. Specifically, we first model managers' earnings forecast decisions using the following probit model:

$$\begin{aligned}\text{Prob}(MF_{t+1} = 1) = f(&\alpha + \beta_1|WCACC_t| + \beta_2 ROA_t + \beta_3 ERC_t + \beta_4|AFE_{t+1}|\\ &+ \beta_5\ln(MV_t) + \beta_6 NANALYSTS_t + \beta_7 BM_t\\ &+ \beta_8 RTNVOL_t + \beta_9 EARNVOL_t + \beta_{10} HITECH_t\\ &+ \beta_{11} REGULATION_t + \varepsilon_{t+1}). \qquad (2)\end{aligned}$$

The variables are defined in the Appendix.

Our Equation (2) and variable measurement closely follow Lennox and Park (2006).[21] In addition, we include the magnitude of working capital accruals (|*WCACC*|) because more extreme accruals are generally more difficult to assess by analysts and investors and hence subject to greater mispricing (e.g., Sloan 1996; Bradshaw et al. 2001). It is possible that managers have greater incentives to provide earnings forecasts when accruals are more extreme in order to mitigate market mispricing. We also include *ROA* to control for the effect of firm performance on the likelihood of issuing management earnings forecasts.

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[21] Lennox and Park (2006) also include analyst forecast revisions of two-period-ahead earnings. We do not include this variable since doing so will substantially reduce our sample size.

We then examine the effect of management earnings forecasts on accrual mispricing using the following ordinary least squares regression with standard errors adjusted for heteroscedasticity and firm-level clustering, after including the inverse Mills ratio (*IMR*) obtained from estimating Equation (2):

$$\begin{aligned} SARET_{t+1} = {} & \alpha_1 NoMF + \alpha_2 MF + \beta_{11} WCACC_t^R \times NoMF \\ & + \beta_{11} WCACC_t^R \times MF + \beta_2 MV_t^R + \beta_3 BM_t^R \\ & + \beta_4 BETA_t + \beta_5 EP_t^R + \beta_6 IMR_t + \varepsilon_{t+1}. \end{aligned} \tag{3}$$

The variables are defined in the Appendix and discussed below.

The dependent variable is buy-and-hold 12-month size-adjusted returns cumulated from the fourth month after the end of year t ($SARET_{t+1}$) and estimated strictly following the recommendation of Kraft et al. (2006). Among independent variables, *NoMF* (*MF*) is an indicator variable that equals 1 (0) for firm-years observations in First Call database where managers make *no* forecasts of year $t+1$ earnings during the year, and 0 (1) for firm-years observations where managers make at least one earnings forecast of year $t+1$ earnings issued at or after year t earnings announcement and before the first quarter earnings announcement for year $t+1$ (i.e., the same sample used in our earlier analyses). $WCACC^R$, MV^R, BM^R, and EP^R are decile ranks of working capital accruals, firm size, book-to-market ratio, and earnings-to-price ratio, respectively, scaled to range from 0 to 1. *BETA* is market beta estimated over the 36-month period prior to the end of year t. Finally, *IMR* is the inverse Mills ratio, included to correct for potential self-selection bias.

Equations (2) and (3) are estimated using an expanded sample that includes our original 4,443 firm-year observations where managers make earnings forecasts ($MF = 1$) and 14,747 firm-year observations in First Call database where managers make no earnings forecasts ($NoMF = 1$).[22] Panel A of Table 8 presents summary statistics for this expanded sample of 19,910 firm-year observations.

Panel B of Table 8 reports our findings from estimating Equations (2) and (3). For Equation (2), we find a significantly positive coefficient on $|WCACC|$ (Coefficient = 0.559, z = 2.09), suggesting that managers tend to issue earnings forecasts when accruals are more extreme. In addition, we find that better performing firms (*ROA*), larger firms ($\ln(MV)$), and firms followed by a larger number of analysts (*NANALYSTS*) are more likely to make management earnings forecasts. Consistent with Lennox and Park (2006), we find a significantly positive coefficient on *ERC*. However, our coefficients on $|AFE|$ and *HITECH* are both significantly negative, contrary to Lennox and Park (2006).

Turning to Equation (3), we find that the coefficients on $WCACC^R \times NoMF$ and $WCACC^R \times MF$ are both significantly negative with similar statistical significance levels (Coefficient = −0.055 and −0.054, t = −2.22 and −2.31, respectively). A formal test of the difference in these two coefficients cannot reject the null of no difference (two-tailed p-value = 0.965), suggesting that investors appear to overreact to working capital accruals to the same extent regardless of whether managers provide earnings forecasts. Hence, the

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[22] We also estimate Equation (3) for firm-year observations with $MF = 1$ (after removing *NoMF* and $WCACC \times NoMF$ from the equation) and firm-year observations with $NoMF = 1$ (after removing *MF* and $WCACC \times MF$ from the equation) separately. We obtain qualitatively similar results as those reported in Panel B of Table 8. In particular, the difference in the coefficients on $WCACC \times MF$ and $WCACC \times NoMF$ across the two samples is statistically insignificant (untabulated).

TABLE 8
Multivariate Regression of One-Year-Ahead Size-Adjusted Returns and Working Capital Accruals Conditional on the Issuance of Management Earnings Forecasts

Panel A: Descriptive Statistics of the Sample (n = 19,190)

Variable	Mean	Standard Deviation	Lower Quartile	Median	Upper Quartile
$SARET_{t+1}$	0.058	0.803	−0.313	−0.044	0.233
$BETA_t$	1.125	0.890	0.544	0.974	1.524
EP_t	0.041	0.202	0.006	0.073	0.125
$\lvert WCACC_t \rvert$	0.052	0.064	0.012	0.029	0.066
ROA_t	−0.015	0.221	−0.026	0.037	0.089
ERC_t	10.803	30.663	−0.013	1.296	10.658
$\lvert AFE_t \rvert$	0.074	0.157	0.006	0.019	0.060
MV_t	2133.920	6159.480	95.496	342.743	1246.790
$NANALYSTS_t$	3.830	5.450	0.000	2.000	6.000
BM_t	0.563	0.511	0.251	0.448	0.719
$RTNVOL_t$	0.157	0.091	0.092	0.135	0.199
$EARNVOL_t$	0.038	0.062	0.008	0.016	0.041
$HITECH_t$	0.234	0.423	0	0	0
$REGULATION_t$	0.078	0.269	0	0	0

Panel B: Two-Stage Regression Results

Equation (2)		Equation (3)	
Dependent Variable	*MF*	**Dependent Variable**	$SARET_{t+1}$
	Coefficient (z-statistic)		**Coefficient (t-statistic)**
$\lvert WCACC_t \rvert$	0.559**	$WCACC_t^R \times NoMF$	−0.055**
	(2.09)		(−2.22)
ROA_t	1.227***	$WCACC_t^R \times MF$	−0.054**
	(10.18)		(−2.31)
ERC_t	0.002***	MV_t^R	−0.076***
	(3.82)		(−3.46)
$\lvert AFE_t \rvert$	−0.875***	BM_t^R	0.049**
	(−4.83)		(2.15)
ln(MV_t)	0.201***	$BETA_t$	0.113***
	(10.86)		(5.48)
$NANALYSTS_t$	0.024***	EP_t^R	0.000
	(4.73)		(0.02)
BM_t	−0.001	*NoMF*	0.045*
	(−0.03)		(1.72)
$RTNVOL_t$	−0.518*	*MF*	0.035
	(−1.85)		(1.19)
$EARNVOL_t$	−0.576	*IMR*	−0.011
	(−1.45)		(−0.76)
$HITECH_t$	−0.257***		
	(−3.80)	Adjusted R^2	0.009
$REGULATION_t$	−0.033	n	19,190
	(−0.26)		

(*continued on next page*)

TABLE 8 (continued)

Equation (2)		**Equation (3)**	
Dependent Variable	*MF*	**Dependent Variable**	$SARET_{t+1}$
	Coefficient (z-statistic)		**Coefficient (t-statistic)**
Intercept	−3.322 (−19.08)		
Industry and Year Fixed Effects	Included	Test of equal accrual mispricing: $WCACC^R \times MF - WCACC^R \times NoMF$	0.001
Number of forecast firm-years	4,443		
Number of no forecast firm-years	14,747	[Two-tailed p-value]	[0.965]
Pseudo R^2	0.455		

***, **, * Indicate significance level at less than 1 percent, 5 percent, 10 percent, respectively, based on two-tailed z-tests (Equation (2)) or t-tests (Equation (3)). The sample period is from 1996 to 2006.

Panel A presents descriptive statistics of the sample.

Panel B reports (1) the probit regression results to predict the forecast issuance decision by management based on the magnitude of working capital accruals and other related firm characteristics (Equation (2)), and (2) ordinary least squares regression results on one-year-ahead 12-month size-adjusted stock returns and working capital accruals (Equation (3)). For Equation (2), the dependent variable is *MF*, which equals 1 for firm-years in which managers issued at least one earnings forecast of year $t+1$ earnings per share during the period from year t earnings announcement to year $t+1$ first quarter earnings announcement, and 0 for firm-years in which managers do not issue any earnings forecasts during year $t+1$. For Equation (3), the dependent variable is size-adjusted abnormal returns during 12 months starting four months after year t fiscal year-end ($SARET_{t+1}$). See the Appendix for the other variable definitions. When estimating the coefficients' standard errors, we use a clustering procedure that accounts for serial dependence across years of a given firm. Z-statistics and t-statistics are presented in parentheses and two-tailed p-values based on F-tests are presented in brackets.

availability of management earnings forecasts does not mitigate accrual mispricing. Consistent with prior studies, we also find that future size-adjusted returns are positively related to book-to-market ratio and market beta and negatively related to firm size (e.g., Fama and French 1992; Basu 1977; Sloan 1996; Desai et al. 2004).

VII. CONCLUSION

This study documents that managers tend to forecast subsequent year earnings more optimistically (pessimistically) when current year accruals are relatively high (low). We also find that this positive association between management earnings forecast errors and accruals is stronger among firms operating in a more uncertain business environment and among firms exhibiting greater covariation between accruals and employee growth. Furthermore, this positive association is significant when accruals likely reflect managers' true beliefs about firms' business prospects, but is nonexistent when accruals are likely manipulated to boost managers' trading gains. These findings suggest that managers' misassessments of firm's business prospects contribute to the positive relation between management earnings forecast errors and accruals. Finally, we find that the availability of management earnings forecasts does not reduce the accrual-based hedge portfolio returns.

We contribute to the voluntary disclosure literature by demonstrating a predictable bias in management earnings forecasts based on historically reported accruals and an insignificant effect of management earnings forecasts on accrual mispricing. Prior research has shown that management earnings forecasts reveal value-relevant information that benefits shareholders by reducing information asymmetry, preempting costly shareholder litigation, and facilitating more efficient pricing of accounting information (Hirst et al. 2008). Our findings caution investors to carefully evaluate forward-looking voluntary disclosures from the management when forming earnings expectations. In addition, policy-makers should be aware that voluntary and mandatory disclosures could contain common errors, and thus encouraging expanded voluntary disclosure (which potentially contains predictable errors related to mandatory disclosure) might not improve a firm's information environment as much as intended.

Our study is subject to several limitations. First, the predictable errors in management earnings forecasts with respect to accruals might not generalize to other types of accounting information. Accruals, compared to other types of accounting information (such as cash flows), heavily rely on managerial projections of firms' business prospects and hence are more likely to contain similar biases as management earnings forecasts. Second, our results might not generalize to other forms of voluntary disclosures, partly because the biases in earnings forecasts can be verified *ex post*, but it is more difficult to verify the biases in other forms of voluntary disclosures, such as conference calls or customer satisfaction (Healy and Palepu 2001). Third, our results suggest that the positive association between management forecast errors and accruals is attributable to managerial misassessments of business prospects. However, alternative explanations might exist and our evidence does not completely rule out competing explanations.

APPENDIX
VARIABLE DEFINITIONS

The association between management earnings forecast errors and accruals (Equation (1)) is tested using the following variables:

MFE_{t+1} = first management forecast of year $t+1$ earnings per share (adjusted for stock splits and dividends) issued at or after year t earnings announcement but before year $t+1$ first quarter earnings announcement minus year $t+1$ actual earnings per share, scaled by the closing share price at the end of year t;

$WCACC_t$ ($WCACC_t^R$) = working capital accruals (decile rank of working capital accruals scaled to range from 0 to 1), measured as − [increase in accounts receivable (Compustat annual data item #302) + increase in inventory (#303) + decrease in accounts payable (#304) + decrease in income tax payable (#305) + net change in other accrued liabilities (#307)]/lagged total assets (#6) (missing values of #304, #305, and #307 are replaced with 0 in computing *WCACC*);

ROA_t = return-on-assets, measured as earnings before extraordinary items (#123) divided by lagged total assets (#6);

$ESURP_t$ = earnings surprise, measured as actual earnings for year t minus the most recent analyst consensus (median) forecast prior to year t earnings announcement (if the firm has no analyst following, we use earnings change as the substitute in order to avoid losing data), scaled by the closing share price at the end of year t;

$AltmanZ_t$ = Altman's Z-score (Altman 1968), computed as [1.2 × working capital (#4 − #5)/total assets − 1.4 × retained earnings (#36)/total assets + 3.3 × operating income (#178)/total assets + 0.6 × market value of equity (#25 × #199)/total liabilities (#181) + sales (#12)/total assets];

$IndCon_t$ = industry concentration, measured as the Herfindahl index calculated as the sum of the squares of the market shares of the firms' sales within each four-digit SIC industry;

$XFIN_{t+1}$ = external financing, measured as net equity financing plus net debt financing scaled by lagged total assets (#6), where net equity financing equals cash proceeds from the sale of common and preferred stock (#108) minus cash payments for the purchase of common and preferred stock (#115) minus cash payments for dividends (#127), and net debt issuance equals cash proceeds from the issuance of long-term debt (#111) minus cash payments for long-term debt reductions (#114) minus the net changes in current debt (#301);

$TRADE_t$ = net sales (in thousands of shares) from open market transactions or stock option transactions (i.e., option grants or option exercises) by the top five executives during the one-month period following management earnings forecasts (per Thomson Financial Insider Trading database);

$LITIGATION_t$ = indicator variable set to 1 for litigious industries including Bio-Technology (SIC 2833 to 2836), Computer Hardware (SIC 3570 to 3577), Electronics (SIC 3600 to 3674), Retailing (SIC 5200 to 5961), and Computer Software (SIC 7371 to 7379), and 0 otherwise;

$RETURN_t$ = buy-and-hold 12-month market-adjusted stock returns for year t;

$\ln(MV_t)$ = natural logarithm of market value of equity (MV), where MV equals year-end stock price (#25) multiplied by common shares outstanding (#199), in millions of dollars;

$NANALYSTS_t$ = number of individual analyst's forecasts in the most recent consensus analyst forecast prior to management earnings forecasts (per First Call);

BM_t = book-to-market ratio, measured as book value of equity (#60) divided by market value of equity (MV);

$CFOVOL_t$ = standard deviation of operating cash flows (#308 − #124) divided by lagged total assets (#6) during the past five years (including year t) scaled by the magnitude of average operating cash flows (divided by lagged total assets) over the same period;

$SALESGRVOL_t$ = standard deviation of sales growth (#12) during the past five years (including year t) scaled by the magnitude of average sales growth over the same period; and

$OPCYCLE_t$ = operating cycle, defined as average accounts receivable (#2) divided by sales (#12) plus average inventory (#3) divided by cost of goods sold (#41) then multiplied by 365.

The influence of management earnings forecasts on accrual mispricing (Equations (2) and (3)) is tested using the following variables in addition to some of the variables defined in Equation (1):

MF_{t+1} = indicator variable set to 1 if managers make earnings forecasts of year $t+1$ earnings at or after year t earnings announcements but before year $t+1$ first quarter earnings announcements, and 0 otherwise;

ERC_t = a firm's earnings response coefficient estimated using the 16 most recent past quarters ending one quarter before the end of year t. Specifically, we regress cumulative market-adjusted stock returns on the earnings surprises of past quarters. Returns are cumulated over two trading days [0, +1] with day 0 being the earnings announcement date in a past quarter. The earnings surprises of a past quarter is equal to actual earnings per share minus the most recent consensus analyst forecast issued before the earnings announcement (both data from First Call), scaled by the closing stock price at day −1. When the consensus analyst forecast is missing from First Call, we use seasonal random walk earnings changes per Compustat as the substitute in order to avoid losing data;

AFE_{t+1} = analyst earnings forecast error calculated as the most recent consensus (median) analyst forecast for year $t+1$ earnings issued prior to year t earnings announcement minus actual earnings per share for year $t+1$, scaled by the closing stock price at the beginning of year t. When the consensus analyst forecast is missing from First Call, we use annual earnings change per Compustat as the substitute in order to avoid losing data;

$RTNVOL_t$ = standard deviation of daily raw stock returns over the 250 trading days ending one quarter before the end of year t, requiring a minimum of 100 daily stock returns;

$EARNVOL_t$ = standard deviation of seasonal changes in quarterly earnings per share over the past 16 quarters ending one quarter before the end of year t, scaled by assets per share at the beginning of year t;

$HITECH_t$ = indicator variable set to 1 if the firm reports one of the following SIC codes: 2833–2836 (Drugs), 8731–8734 (R&D Services), 7371–7379 (Programming), 3570–3577 (Computers), or 3600–3674 (Electronics), and 0 otherwise;

$REGULATION_t$ = indicator variable set to 1 if the firm reports the following SIC codes: 4812–4813 (Telephone), 4833 (TV), 4841 (Cable), 4811–4899 (Communications), 4922–4924 (Gas), 4931 (Electricity), 4941 (Water), or 6021–6023, 6035–6036, 6141, 6311, 6321, 6331 (Financial firms), and 0 otherwise;

$SARET_{t+1}$ = buy-and-hold 12-month size-adjusted returns cumulated from the fourth month after the end of year t and estimated strictly following the recommendation of Kraft et al. (2006);

$NoMF$ (MF) = indicator variable set to 1 (0) for firm-year observations in First Call database where managers make *no* forecasts of year $t+1$ earnings during the year, and 0 (1) for firm-year observations where managers make at least one earnings forecast of year $t+1$ earnings issued at or after year t earnings announcement and before year $t+1$ first quarter earnings announcement;
$WCACC^R$ = decile ranks of $WCACC$, scaled to range from 0 to 1;
MV^R = decile ranks of MV, scaled to range from 0 to 1;
BM^R = decile ranks of BM, scaled to range from 0 to 1;
$BETA$ = market beta estimated over the 36-month period prior to the end of year t; and
EP^R = decile ranks of earnings-to-price ratio, scaled to range from 0 to 1.

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Auditor Switches in the Pre- and Post-Enron Eras: Risk or Realignment?

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ABSTRACT: Using a comprehensive sample of switches to and from the largest auditors (i.e., the Big N), we examine empirically whether the sensitivity of Big N auditor switches to client risk and misalignment changed between the pre- and post-Enron periods. Although we find an increase in the sensitivity to client misalignment, the sensitivity to client risk generally decreases. The results are consistent with Big N auditors rebalancing their audit client portfolios in response to post-Enron capacity constraints arising from the supply of former Arthur Andersen clients and the audit demands imposed by Sarbanes-Oxley rather than increasing their sensitivity to client risk. Additional evidence indicates that the Sarbanes-Oxley demand shock did not affect Big N auditor switching behavior incremental to the initial Andersen supply shock.

Keywords: *auditor switching; client risk; client misalignment; Sarbanes-Oxley.*

Data Availability: *The data used in this study are publicly available from the sources indicated in the text.*

I. INTRODUCTION

Recent accounting scandals, including Enron, WorldCom, Global Crossing, and Qwest, have brought about a sea change in the audit industry, most notably the dissolution of Arthur Andersen. The accounting industry has responded to the scandals in several ways, including an assertion by the remaining top-tier accounting firms

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(i.e., the Big N) that they have since dropped hundreds of clients that expose them to unacceptable levels of risk. For example:

> After watching former Big Five accounting firm Arthur Andersen implode after its Enron Corp. entanglement, the surviving Big Four aren't leaving much to chance. PricewaterhouseCoopers and Deloitte & Touche each have shed about 500 clients in the past 18 months because of liability concerns. With earnings being restated at a record clip, shareholder lawsuits have increased. "We have tightened up our standards," says Gregory Weaver, the head of Deloitte's U.S. audit practice. Ernst & Young has parted ways with more than 200 clients. (Hindo 2003)

A recent report by the General Accounting Office (GAO 2006) also suggests the Big N have become more selective regarding risky clients.

A reduced tolerance for risk, however, may not be an adequate explanation for observed changes in auditor switch behavior following the collapse of Enron and Andersen. In particular, this explanation fails to consider the effects of two exogenous shocks to the audit market in the post-Enron period. Specifically, the demise of Andersen caused an exogenous shock to the supply of available audit clients for the remaining Big N auditors, while the enactment of the Sarbanes-Oxley Act of 2002 (SOX) caused an exogenous shock to the demand for Big N audit services because SOX Section 404 (SOX 404) requires management and the external auditor to report on the adequacy of the company's internal control over financial reporting. These shocks resulted in a temporary capacity constraint for the Big N, thereby creating a unique opportunity for the Big N to rebalance their audit client portfolios without necessarily adjusting their sensitivity to client risk. That is, the sudden availability of Andersen clients that are better aligned with the remaining Big N than some of their existing clients, combined with the auditing demands imposed by SOX, could have resulted in less well-aligned clients moving downward to a lower-tier auditor. This rebalancing of client portfolios by the Big N can be viewed as a special type of client realignment distinct from realignment arising from endogenous changes in the operating environment of the audit client (including changes in client risk) or the strategy of the audit firm (Johnson and Lys 1990; Shu 2000).

In this study, we examine empirically whether client risk and client misalignment are differentially associated with Big N auditor switch decisions in the pre- and post-Enron periods. We define the period before (after) October 15, 2001—the date of Enron's restatement announcement—as the pre- (post-) Enron period. Our focus on client portfolio management by the Big N leads us to consider three types of auditor switch decisions: (1) clients not switching Big N auditors, (2) clients switching to a Big N auditor, either laterally from another Big N auditor or upward from a lower-tier auditor (hereafter, lateral/upward switches), and (3) clients switching away from a Big N auditor to a lower-tier auditor (hereafter, downward switches).

Consistent with prior research, we predict a downward switch is more likely for risky clients and misaligned clients. In addition, if Big N auditors have become more sensitive to client risk, as suggested by the GAO (2006) report, then the sensitivity of downward switches to client risk variables will be greater in the post-Enron period. Similarly, if the exogenous capacity shocks stemming from the collapse of Andersen and the enactment of SOX 404 increased the sensitivity of Big N auditors to client misalignment, then the sensitivity of downward switches to client misalignment will be greater in the post-Enron period. Because prior research suggests that risky clients and misaligned clients switch downward, lateral/upward switches are generally not expected to be associated with these client characteristics.[1]

We model the auditor switch decision as a function of client-specific audit and financial risk factors, client misalignment, and various controls, using multinomial logistic regression. This approach allows us to test whether the sensitivity of the auditor switch decision to client risk and misalignment differs for lateral/upward switches and downward switches, as well as whether the sensitivity differs in the pre- and post-Enron periods. We estimate our regression models using all available observations between 1993 and 2001 (pre-Enron), and between 2002 and 2005 (post-Enron), for which the requisite data are available. We exclude auditor switches directly relating to Andersen in the post-Enron period because such switches were essentially forced rather than subject to discretion on the part of Andersen or its former clients (Barton 2005; Blouin et al. 2007).

As expected, results from estimation of our auditor switch model show that lateral/upward switches in the post-Enron period exhibit similar client risk and misalignment characteristics to companies retaining their incumbent Big N auditors. This finding contrasts with the pre-Enron period in which lateral/upward switches have significantly greater audit and financial risk, as well as a higher probability of misalignment. The evidence is consistent with Big N auditors becoming more sensitive to client risk in the post-Enron period, and thus risky clients are, on average, no longer switching laterally/upward to a Big N auditor. However, the evidence is also consistent with Big N auditors rebalancing their portfolios in response to the post-Enron capacity constraints. Consequently, it is difficult to determine from the analysis of lateral/upward switches whether changes in auditor switching behavior are primarily related to client risk or misalignment. To disentangle these effects, we examine downward switches in the pre- and post-Enron periods, where we have clearer predictions.

We find the frequency of downward switches more than doubled in the post-Enron period. Notably, the absolute number of downward switches is approximately the same across the two periods, although the post-Enron period in our analysis (2002–2005) is substantially shorter than the pre-Enron period (1993–2001). More importantly, results from the estimation of the auditor switch model reveal that downward switches are significantly less sensitive to a number of client risk characteristics in the post-Enron period. In contrast, downward switches are significantly more sensitive to client misalignment in the post-Enron period. Thus, the capacity shocks of the post-Enron period appear to be largely responsible for increasing the sensitivity to client misalignment while at the same time decreasing the relative importance of client risk in Big N auditor switch decisions. In other words, the exogenous supply and demand shocks affecting the audit market in the post-Enron period resulted in a higher cost of misalignment relative to client risk, thereby masking any potential increases in Big N audit firms' risk sensitivities.

To further examine auditor switch decisions, and particularly the role of client risk in those decisions, we conduct additional analyses comparing resignations and dismissals. Because resignations are auditor-initiated actions, we predict the sensitivity of downward switches to client risk is greater for resignations than client-initiated dismissals, particularly in the post-Enron period. We make no predictions about the relative sensitivities of resignations and dismissals to misalignment because misalignment can occur for either client- or auditor-related reasons. We do expect these sensitivities to increase, however, in the post-Enron period as a result of the capacity constraints arising from the demand and supply shocks. To test these predictions, we estimate a multinomial logistic regression for the subsample of clients switching auditors, permitting coefficient estimates to differ for auditor resignations and client dismissals. This dismissal-resignation model includes two client risk variables not in the auditor switch model, client-auditor disagreements and reportable events, which are only available for the subset of clients switching auditors.

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[1] It is possible that misalignment could result in a client switching upward to the Big N from a lower-tier auditor. Such upward switches occur relatively infrequently, however, and thus are unlikely to substantially affect the empirical results. We address this issue later in the study.

Results from estimation of the dismissal-resignation model indicate that resignations are more sensitive to client risk than dismissals in both the pre- and post-Enron periods. However, neither resignations nor dismissals display an increased sensitivity to client risk in the post-Enron period, and the difference in sensitivities to client risk and misalignment between resignations and dismissals does not change between the pre- and post-Enron periods. These findings indicate the distinction between downward resignations and dismissals does not explain changes in the Big N auditor switch market related to client risk sensitivity and misalignment in the period surrounding the collapse of Enron.

In other tests, we perform a subperiod analysis in which we permit the auditor switch model coefficients in the post-Enron period to vary before and after SOX 404. Despite relaxing the constraint on the coefficient estimates, the findings reveal few differences in coefficient estimates on the risk variables across the two subperiods. However, the sensitivity to client misalignment is statistically and economically greater before SOX 404, indicating that the effects of the SOX 404 demand shock did not alter auditor switch behavior incremental to the effects of the Andersen supply shock. Finally, we show that our results are robust to a variety of specification checks, including estimations of the auditor switch model with several alternative measures of client risk.

Our study is the first to present evidence regarding the impact of both client risk and misalignment on auditor switches in the pre- and post-Enron periods.[2] Using a multinomial logistic regression model that conditions on the direction of the Big N auditor switch, i.e., lateral/upward, downward, or no change, and permits coefficients on measures of economic determinants of the auditor switch decision to differ pre- and post-Enron, enables us to distinguish more clearly the underlying cause of the change in auditor switch behavior. Although there is a substantial prior literature examining auditor switches, most of the studies examine switching in the context of endogenous changes in client and/or auditor characteristics. In contrast, by focusing on the auditor switch decision pre- and post-Enron, we present evidence on the impact of two large exogenous shocks to the audit market, the demise of Andersen and the implementation of SOX 404, on the economic determinants of the auditor switch decision. Our primary findings suggest that the conclusion of the GAO (2006) that Big N auditors responded to the Enron-Andersen collapse by dropping risky clients does not give a complete picture of the reasons for the post-Enron shift in auditor switch behavior. Although downward switches are more risky than lateral/upward switches in the post-Enron period, the importance of client risk as a determinant of switching behavior actually declined for both downward and lateral/upward switches in the post-Enron period. In contrast, sensitivity to client misalignment increased for downward-switching firms relative to lateral/upward-switching firms in the post-Enron period.

Section II develops the hypotheses. Section III outlines our research design, including our empirical predictions, and describes the data. Section IV presents the primary findings while Section V presents findings from additional specifications. Section VI summarizes and concludes the study.

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[2] Other contemporaneous studies also examine auditor switches in the period around Enron and SOX (Hertz 2006; Rama and Read 2006; Cassell et al. 2007; Ettredge et al. 2007), but none considers the important and potentially confounding effects of client misalignment.

II. HYPOTHESIS DEVELOPMENT

Risk-Induced Auditor Switching

Auditors frequently cite risk management as a key objective when balancing their client portfolios (e.g., Holland et al. 1993; Berton 1995; MacDonald 1997; Hindo 2003). Consistent with these claims, empirical evidence generally documents a positive association between client risk factors and auditor switches, particularly when the auditor resigns from the engagement (e.g., Krishnan and Krishnan 1997; Shu 2000; Johnstone and Bedard 2004). In addition to divesting risky clients, risk assessments appear to factor into auditors' client acceptance decisions. Specifically, audit partners at large firms are less likely to recommend acceptance of the riskier companies in a pool of prospective clients (e.g., Johnstone 2000; Johnstone and Bedard 2003), and they perceive newly accepted clients to be less risky than continuing clients (Johnstone and Bedard 2004).[3]

Conventional wisdom suggests that risky clients leaving a Big N auditor are forced to hire smaller, lower-tier accounting firms (e.g., Holland et al. 1993; Berton 1995; MacDonald 1997; Hindo 2003). Consistent with this perception, Bockus and Gigler (1998) analytically demonstrates that auditors will resign from riskier clients, and that these clients then engage a smaller (i.e., more wealth-constrained) auditor. In other words, smaller auditors can better absorb risky clients because the marginal revenue from the new client is more likely to exceed the risk-adjusted cost. Shu (2000) finds that riskier clients are less likely to engage another large auditor when the incumbent auditor resigns from the engagement. Taken together, the findings in the auditor switch literature lead us to predict that riskier Big N audit clients are more likely to switch downward to smaller, lower-tier auditors.

The demise of Andersen following the Enron bankruptcy likely increased auditors' assessments of the risk any one client poses. In addition, the sudden availability of former Andersen clients with low risk and the increased auditing demands imposed by SOX raised the cost of retaining high-risk clients already in the Big N auditor portfolios. Therefore, we predict Big N auditors exhibit an increase in sensitivity to client risk characteristics in the post-Enron period.[4] That is, we predict the likelihood of downward switching for riskier Big N audit clients increases in the post-Enron period.

Misalignment and Auditor Switching

In addition to risk-based theories, prior research suggests a distinct, although non-mutually exclusive, explanation for auditor switches. Specifically, Johnson and Lys (1990) and Shu (2000) posit that an auditor switch can occur because of a shift in the economics of the auditor-client relationship. As a result of this misalignment, the client switches to an auditor of substantially different size. More generally, the notion underlying these studies is that changes in either client or auditor characteristics result in misalignment that is corrected by switching auditors. As a result, we expect that misaligned Big N audit clients are more likely to switch downward to smaller, lower-tier auditors.

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[3] A related stream of literature examines whether auditors accept risky clients, but attempt to manage this risk by adjusting audit fees, audit procedures, and/or engagement personnel. The evidence in this regard, however, is mixed. The findings in Johnstone (2000) are not consistent with auditors adopting such risk-management strategies, whereas Bell et al. (2001) and Johnstone and Bedard (2003) report that auditors do appear to respond to client risk factors. Bell et al. (2001) also note, however, that risk-management strategies cannot, in principle, eliminate or reduce auditor business risk below a certain level.

[4] It is also possible that Big N auditors increase their sensitivity to client risk characteristics in the post-Enron period because of a perceived increase in litigation risk. Extant research suggests that Big N auditors alter their client portfolios across periods of varying litigation risk (Jones and Raghunandan 1998; Francis and Krishnan 2002; Choi et al. 2004). Because it is unclear whether the post-Enron period, including the passage of SOX, exposed Big N auditors to greater litigation risk than in the pre-Enron period, we do not focus on litigation risk in our primary tests. Rather, we examine litigation risk in our robustness tests in Section V.

In contrast to prior studies examining auditor switches in response to endogenous changes in auditor-client alignment, our study examines how the Big N audit market responded to two Enron-related exogenous shocks—the supply shock arising from the collapse of Andersen and the demand shock arising from the implementation of SOX 404. Each of these shocks imposed a capacity constraint on the Big N auditors. The supply shock made it difficult for Big N auditors to absorb Andersen clients while retaining all of their existing clients. The demand shock exacerbated this capacity constraint because of the requirement to perform additional audit tasks for each audit. As a result, the sudden availability of relatively better-aligned Andersen clients, combined with the implementation of SOX 404, increases the likelihood that relatively less well-aligned Big N clients move downward to lower-tier auditors. This leads us to predict an increase in the sensitivity to auditor-client misalignment for downward switches in the post-Enron period.

III. RESEARCH DESIGN AND DATA

Auditor Switch Model

We model the auditor switch decision involving Big N auditors (hereafter, the auditor switch model) as a function of company-specific risk factors, client misalignment, and various controls, including industry fixed effects to allow for differences in mean switch rates across industries:

$$\begin{aligned} SWITCH_{it} = {} & \Sigma_I \alpha_I + \alpha_1 GROWTH_{it-1} + \alpha_2 ABSDACC_{it-1} + \alpha_3 INVREC_{it-1} \\ & + \alpha_4 GC_{it-1} + \alpha_5 MODOP_{it-1} + \alpha_6 TENURE_{it-1} + \alpha_7 ROA_{it-1} \\ & + \alpha_8 LOSS_{it-1} + \alpha_9 LEVERAGE_{it-1} + \alpha_{10} CASH_{it-1} \\ & + \alpha_{11} MISMATCH_{it-1} + \alpha_{12} EXPERT_{it-1} + \alpha_{13} SIZE_{it-1} \\ & + \alpha_{14} M\&A_{it-1} + \varepsilon_{it} \end{aligned} \tag{1}$$

where the variables are defined as follows (Compustat data items in parentheses):

SWITCH = 0 if the company did not switch Big N auditors, 1 if the company switched laterally/upward to a Big N auditor, or 2 if the company switched downward to a non-Big N auditor;[5]
GROWTH = total assets (#6) less beginning total assets, divided by beginning total assets;
ABSDACC = absolute value of discretionary total accruals;
INVREC = inventory (#3) plus receivables (#2), divided by total assets (#6);
GC = 1 if the audit opinion is a going concern, and 0 otherwise;
MODOP = 1 if the audit opinion is modified for anything other than a going concern, and 0 otherwise;

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[5] By design, the auditor switch model excludes lateral non-Big N auditor switches and clients with non-Big N auditors that did not switch auditors.

TENURE = number of years audited by the incumbent auditor, with a maximum of 10 years;
ROA = return on assets, defined as net income before extraordinary items (#18) divided by average total assets (#6);
LOSS = 1 if *ROA* < 0, and 0 otherwise;
LEVERAGE = ratio of debt (#9 + #34) to total assets (#6);
CASH = cash (#1) divided by total assets (#6);
MISMATCH = 1 if the company is mismatched with the incumbent auditor, following the methodology in Shu (2000), and 0 otherwise;
EXPERT = 1 if the incumbent auditor has at least 5 percent more clients in a particular industry and state than any other auditor, and 0 otherwise;
SIZE = natural logarithm of market value of equity (#25 × #199);
M&A = 1 if the client had a merger or acquisition (footnote code #1) in the two most recent years, and 0 otherwise;
i denotes client firm;
t denotes year; and
I denotes industry, as defined in Barth et al. (1998).

We estimate the auditor switch model using multinomial logistic regression, which allows us to test whether the sensitivity of auditor switches to client risk and misalignment differs for lateral/upward switches and downward switches. Multinomial logit is an extension of the binary logit model to multiple choices. The procedure estimates the probability of a particular alternative relative to the probabilities of all other alternatives, with no change in Big N auditor serving as the reference category. In the estimation of Equation (1) there are three alternatives: (1) no change in auditor, (2) lateral/upward switch, or (3) downward switch. We also interact all variables with an indicator variable set equal to 0 (1) for the pre-Enron (post-Enron) period, and report coefficient estimates separately for each period as well as tests of coefficient differences across periods. An advantage of this research design is that it permits comparisons of coefficients across alternatives and over time. In other words, we can directly test how the composition of Big N auditor portfolios is affected by changes in sensitivities to client risk and misalignment characteristics over time.

As described in Section II, we expect downward switches to exhibit greater sensitivity to client risk and misalignment relative to clients not switching Big N auditors and to clients switching laterally/upward to a Big N auditor.[6] More important, if Big N auditors are more sensitive to client risk in the post-Enron period, as suggested by the GAO (2006) report, then the sensitivity of downward switches to client risk will be greater in the post-Enron period. Further, if the supply and demand shocks stemming from the collapse of Andersen and the enactment of SOX 404 increase the sensitivity of Big N auditors to client misalignment, then the sensitivity of downward switches to misalignment will be greater in the post-Enron period.

Following prior research, we consider two sources of client risk: financial risk and audit risk. As commonly defined, client financial risk is the risk of a decline in the client's economic condition, and audit risk is the risk that the auditor will incorrectly give an unqualified opinion on financial statements that are materially misstated.[7] The audit risk measures are *GROWTH*, *ABSDACC*, *INVREC*, *GC*, *MODOP*, and *TENURE*. Audit risk is greater when the client has an ineffective internal control system, thereby increasing the likelihood of issuing misleading financial statements. Stice (1991) finds a positive association between client growth and auditor litigation, which is indicative of a high audit risk environment. Accordingly, we expect the probability of an auditor switch to increase with *GROWTH*, which is likely to be higher for high audit risk clients.[8] Further, an auditor switch is more likely if the client and auditor disagree on the appropriate application of accounting standards, which arises particularly when the client uses positive discretionary accruals that boost income (DeFond and Subramanyam 1998).[9] Large negative discretionary accruals are consistent with auditor conservatism, creating an incentive for clients to dismiss the incumbent auditor in hopes of finding a more reasonable successor (DeFond and Subramanyam 1998). Therefore, we expect the probability of an auditor switch to increase with large positive or negative discretionary accruals, which we capture by the absolute value of discretionary accruals, *ABSDACC*.[10]

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[6] We do not expect lateral/upward switches to be associated with client risk and misalignment in general, although relative to clients not switching Big N auditors, there may be a greater sensitivity to client misalignment associated with upward switches.

The remaining audit risk variables capture client-specific aspects of the audit engagement. Following Dopuch et al. (1987) and Krishnan (1994), we expect audit risk increases in the level of inventories and receivables as a fraction of total assets (*INVREC*). Following Krishnan and Krishnan (1997) and Johnstone and Bedard (2004), we expect companies with other than a clean opinion (*GC* and *MODOP*) are more risky, increasing the likelihood of a change in auditors. Stice (1991) and Krishnan and Krishnan (1997) assert that audit risk also relates to the tenure of the auditor-client relationship (*TENURE*); shorter tenure with a client results in less client-specific knowledge and a greater likelihood of audit failure, thus increasing the likelihood of a change in auditors.

Following Johnstone and Bedard (2004), we include *ROA*, *LOSS*, and *LEVERAGE* as measures of financial risk. More profitable companies pose less financial risk to the auditor, and thus we expect companies with lower *ROA* and those with a *LOSS* to be more likely to switch auditors. Similarly, higher *LEVERAGE* poses greater financial risk, which we expect will result in an increased probability of switching auditors. Similarly, the less cash a firm has on hand (*CASH*), the higher the likelihood of financial difficulty and, hence, an auditor switch.

To summarize, we expect the above client audit and financial risk characteristics from prior research to increase the likelihood of a downward auditor switch. In addition, if audit firms have become more sensitive to client risk post-Enron, as the GAO (2006) report suggests, then we expect a significant increase in the sensitivity of Big N auditors to these client risk characteristics. In other words, we predict that risky clients will be more likely to switch downward and less likely to switch laterally/upward in the post-Enron period.

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[7] A third type of risk, auditor business risk, captures the audit firm's risk of loss resulting from the engagement. Although we do not explicitly include measures of business risk in Equation (1), several of our client financial and audit risk measures likely are correlated with it (O'Keefe et al. 1994). However, as reported in Section V, we estimate an alterative specification of Equation (1) that includes a measure of client-related auditor litigation risk based on Shu (2000), which is related to all three types of client risk.

[8] Because we have no predictions for lateral Big N switches, the predictions relating to *GROWTH* and all remaining client risk and misalignment proxies pertain to downward switches.

[9] Relatedly, Heninger (2001) finds the risk of auditor litigation increases for clients reporting more positive (income-increasing) abnormal accruals.

[10] Because large negative discretionary accruals reflect auditor conservatism, not audit risk, and increase the likelihood of dismissals, it is possible that auditor switch sensitivities differ for both positive and negative discretionary accruals and for resignations and dismissals. The first issue is considered in the robustness section; the latter is directly addressed in Equation (2) below.

To test the prediction that downward switches are more sensitive to client misalignment, we include *MISMATCH* as a misalignment proxy. Following Shu (2000), we calculate an annual index measure for each client that captures how well the client is matched with its current auditor based on factors related to the auditor's cost structure and opportunity set. We then determine an optimal cut-off probability that predicts whether a client is better matched with a Big N or a non-Big N auditor.[11] If an actual auditor-client pairing is opposite to the prediction in the prior year, then we consider the client mismatched with its auditor and expect the likelihood of a switch to increase. We set the resulting indicator variable, *MISMATCH*, equal to 1 if the company is mismatched with its incumbent auditor, and 0 otherwise.

Finally, in addition to industry fixed effects, we include auditor industry expertise (*EXPERT*), client size (*SIZE*), and merger and acquisition activity (*M&A*) as additional control variables. Audit firms exhibit general tendencies consistent with investment in industry expertise (e.g., Hogan and Jeter 1999), and we expect clients with an industry expert auditor to be less likely to switch auditors. Because the costs of switching auditors are expected to be higher for larger clients (DeAngelo 1981), we predict larger companies are less likely to switch. We include *M&A* because companies are more likely to switch auditors after a merger or acquisition if the newly combined entities had previously engaged different auditors. We do not make predictions concerning changes in the sensitivity of the auditor switch decision to the control variables across the pre- and post-Enron periods.

Dismissal-Resignation Model

We extend the basic regression model by focusing on the dismissal-resignation decision to determine whether the primary findings differ for dismissals and resignations. Prior research finds that auditors are more likely to resign rather than be dismissed from clients that pose greater risk (Krishnan and Krishnan 1997), and that clients associated with resignations are riskier than continuing clients (Shu 2000; Johnstone and Bedard 2004). We therefore expect the sensitivity of auditor switches to client risk characteristics to be greater for resignations than dismissals. Further, if Big N auditors are more sensitive to client risk characteristics in the post-Enron period, then the difference in sensitivities between resignations and dismissals will increase in the latter period. Because misalignment can occur for client- and/or auditor-related reasons, we make no predictions about the relative sensitivities between resignations and dismissals, but expect the sensitivities to increase in the post-Enron period as a result of the demand and supply shocks.

The dismissal-resignation model permits coefficient estimates in the pre- and post-Enron periods to differ for dismissals and resignations. However, the classification of resignations and dismissals is likely to contain noise, biasing against finding a difference in coefficient estimates between the two subsamples.[12] The dismissal-resignation model is specified as follows:

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[11] See the Appendix for further details.

[12] Firms are required to disclose in an 8-K filing whether the auditor resigned, declined to stand for re-election, or was dismissed. We consider declining to stand for re-election as tantamount to a resignation, and code these few observations accordingly. We note that the two-way partition, although common in prior research, does not necessarily fully capture the underlying dynamics of the auditor change. For example, auditors may prefer to be dismissed from an engagement because of concerns that resignations could harm their ability to attract new clients. Alternatively, clients may rush to dismiss an auditor they believe is about to resign because of concerns that the resignation will be viewed negatively by market participants and perhaps even regulators.

$$\begin{aligned} RESIGN/DISMISS_{it} = {} & \Sigma_I \alpha_I + \alpha_1 GROWTH_{it-1} + \alpha_2 ABSDACC_{it-1} \\ & + \alpha_3 INVREC_{it-1} + \alpha_4 GC_{it-1} + \alpha_5 MODOP_{it-1} \\ & + \alpha_6 TENURE_{it-1} + \alpha_7 ROA_{it-1} + \alpha_8 LOSS_{it-1} \\ & + \alpha_9 LEVERAGE_{it-1} + \alpha_{10} CASH_{it-1} \\ & + \alpha_{11} DISAGREE_{it-1} + \alpha_{12} REPEVENTS_{it-1} \\ & + \alpha_{13} MISMATCH_{it-1} + \alpha_{14} EXPERT_{it-1} + \alpha_{15} SIZE_{it-1} \\ & + \alpha_{16} M\&A_{it-1} + \varepsilon_{it} \end{aligned} \tag{2}$$

where:

RESIGN/DISMISS = 0 if the company dismissed its auditor and switched laterally/upward to a Big N auditor, 1 if the auditor resigned and the company switched laterally/upward to a Big N auditor, 2 if the company dismissed its auditor and switched downward to a non-Big N auditor, and 3 if the auditor resigned and the company switched downward to a non-Big N auditor;
DISAGREE = 1 if the 8-K filing discloses an accounting disagreement with the incumbent auditor, and 0 otherwise; and
REPEVENTS = 1 if the 8-K filing discloses a reportable event, and 0 otherwise.[13]

All other variables are as previously defined.

The model uses lateral/upward dismissals as the reference category. We estimate Equation (2) using the sample of companies switching auditors to enable us to include two additional client risk variables, client-auditor disagreements (*DISAGREE*) and reportable events (*REPEVENTS*), that are only available for the subset of clients switching auditors. Client-auditor disagreements and reportable events are significant indicators of heightened audit and financial risk (Krishnan and Krishnan 1997). As with the auditor switch model, we interact all variables with an indicator for the post-Enron period, and predict downward switches arising from both resignations and dismissals are more sensitive to client risk and misalignment. Because the focus of this analysis is on downward switches, we tabulate only those results and test whether the sensitivity of downward switches to client risk and misalignment differs for resignations and dismissals and whether these sensitivities changed in the post-Enron period.

Data

Our sample of auditor switches is drawn from fiscal years 1993–2001 (pre-Enron) reported on the AuditorTrak database and from fiscal years 2002–2005 (post-Enron) on the

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[13] Securities and Exchange Commission (SEC) rules require registrants to report a change in auditor by filing a Form 8-K. Among other disclosure requirements, the company must reveal whether in the two most recent fiscal years the auditor had advised them of any of the following reportable events: (1) internal controls necessary to develop reliable financial statements do not exist; (2) the auditor was unwilling to rely on management's representations; (3) the scope of the audit needs to be significantly expanded; or (4) information has become available that materially affects the fairness or reliability of a previously issued audit report or financial statements. The company must also disclose any disagreements on accounting matters even if resolved to the auditor's satisfaction.

Auditor Analytics database.[14] The pre-Enron sample thus spans a period of relative stability in the audit market, with only one merger among the major audit firms—between Coopers & Lybrand and Price Waterhouse in 1998—and prior to the dissolution of Andersen and subsequent governance reforms that together caused many public companies and their auditors to reassess their business relationship. We exclude companies in the financial services sector (SIC codes 6000–6999) because of its unique operating environment and differences in accounting classifications that make inferences difficult in subsequent analyses. Because our focus is on auditor switches involving a Big N auditor, we also exclude all lateral switches between non-Big N auditors. Finally, the pre-Enron period excludes all auditor switches after October 15, 2001 (the date Enron announced is restatement plans), while the post-Enron period excludes all switches involving Andersen.[15]

Table 1 reports the frequency of auditor switches during the pre-Enron (Panel A) and post-Enron (Panel B) periods. Of the 3,501 switches in Panel A, lateral switches between Big N auditors occur with the greatest frequency (1,632 or 46.6 percent), surpassing downward switches from a Big N to a non-Big N auditor (1,181 or 33.7 percent), and upward switches to a Big N auditor (688 or 19.7 percent). A similar ranking emerges when the data are weighted by the client's total sales revenue in the year prior to the switch.[16] The remaining columns in Table 1, Panel A, partition the data into auditor resignations and client dismissals. The results are generally similar in both analyses, although lateral Big N switches are relatively less common in the case of an auditor resignation, and downward switches to a non-Big N auditor are relatively more common.

Findings for the post-Enron period reported in Table 1, Panel B reveal that downward switches (1,160 or 61.8 percent) occur twice as often as lateral switches between Big N auditors (555 or 29.6 percent), although the later category continues to dominate on a sales-weighted basis. Moreover, downward switches comprise the majority of both auditor resignations and client dismissals. These results suggest that the auditor switch market has undergone some substantial changes in the period following the Enron scandal. In the following section, we provide evidence on the extent to which client risk and misalignment explain auditor switches in the pre- and post-Enron eras.

IV. RESULTS

Univariate Statistics

Table 2 presents variable means for the switch and non-switch samples in the pre- and post-Enron periods. Panel A presents statistics comparing differences in means for the lateral/upward and non-switch samples in both periods; Panel B presents analogous statistics for the downward switch sample. Because of missing data, the auditor switch sample

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[14] The sample period begins in 1993 because that is the earliest year for which we can obtain a comprehensive sample of auditor switches from AuditorTrak. We use the Auditor Analytics database in the post-Enron period for two reasons: Auditor Analytics covers auditor switches beginning in 2000, and we do not have access to AuditorTrak in the later time period. Nonetheless, both data sets are comprehensive, and we are not aware of any biases in either database that would confound comparisons of results across time periods. The databases obtain the identity of both the predecessor and successor auditors from a search of SEC filings and other sources. Both databases also provide information on whether the auditor resigned or was dismissed by the client, as reported in the 8-K filing, the date of the change, and total sales revenue in the last fiscal year audited by the predecessor auditor. Source: AuditorTrak. Copyright 2003 by Strafford Publications, Inc. All rights reserved. Used by permission.

[15] In untabulated sensitivity analysis, we also exclude from the post-Enron period all non-Andersen switches from January 1, 2002 to June 15, 2002, the date Andersen was convicted, with no change in inferences.

[16] All sales-weighted data have been adjusted for inflation.

TABLE 1
Switches Involving Big N Auditors in the Pre- and Post-Enron Eras

Panel A: Pre-Enron Auditor Switches by Type

	Pooled			Resignations			Dismissals		
Direction of Change	**Number**	**Freq. (%)**	**Sales Wtd. (%)**	**Number**	**Freq. (%)**	**Sales Wtd. (%)**	**Number**	**Freq. (%)**	**Sales Wtd. (%)**
Non-Big N to Big N (Up)	688	19.7	2.5	58	8.0	1.6	630	22.7	2.7
Big N to non-Big N (Down)	1,181	33.7	6.4	443	60.9	25.5	738	26.6	2.4
Lateral Big N	1,632	46.6	91.1	226	31.1	72.9	1,406	50.7	94.9
Total	3,501	100.0	100.0	727	100.0	100.0	2,774	100.0	100.0

Panel B: Post-Enron Auditor Switches by Type

	Pooled			Resignations			Dismissals		
Direction of Change	**Number**	**Freq. (%)**	**Sales Wtd. (%)**	**Number**	**Freq. (%)**	**Sales Wtd. (%)**	**Number**	**Freq. (%)**	**Sales Wtd. (%)**
Non-Big N to Big N (Up)	162	8.6	3.3	39	7.6	3.5	123	9.0	3.3
Big N to non-Big N (Down)	1,160	61.8	13.5	403	78.1	41.1	757	55.6	10.2
Lateral Big N	555	29.6	83.2	74	14.3	55.4	481	35.4	86.5
Total	1,877	100.0	100.0	516	100.0	100.0	1,361	100.0	100.0

This table provides descriptive statistics on auditor switches between January 1, 1993 and October 15, 2001 in Panel A (Pre-Enron), and January 1, 2002 and April 1, 2006 in Panel B (Post-Enron), except for companies in the financial service industries (SIC codes 6000–6999). Big N auditors are defined as Arthur Andersen, Deloitte & Touche, Ernst & Young, KPMG, and PricewaterhouseCoopers or its predecessor firms, Price Waterhouse and Coopers & Lybrand. All other auditors are classified as non-Big N. Switches from Andersen as a result of their collapse are excluded in Panel B. Sales in the sales-weighted calculations is for the last fiscal year audited by the predecessor auditor, per the AuditorTrak database in the 1993–2001 period and Auditor Analytics in the 2002–2005 period (supplemented by Compustat data if necessary), adjusted for inflation.

TABLE 2
Descriptive Statistics for Regression Variables

Panel A: Comparison of Lateral/Upward Switches versus Non-Switch Observations

	Pre-Enron		Post-Enron	
Variable	**Non-Switch**	**Switch**	**Non-Switch**	**Switch**
GROWTH	0.17	0.30***	0.11	0.14
ABSDACC	0.10	0.13***	0.09	0.11**
INVREC	0.31	0.32**	0.24	0.25
GC	0.03	0.08***	0.03	0.04
MODOP	0.29	0.32**	0.55	0.51
TENURE	6.67***	5.21	6.71***	5.56
ROA	−0.03***	−0.12	−0.06	−0.07
LOSS	0.31	0.49***	0.38	0.38
LEVERAGE	0.23	0.25***	0.22	0.23
CASH	0.18	0.18	0.22	0.21
MISMATCH	0.16	0.32***	0.18	0.24**
EXPERT	0.29***	0.21	0.32***	0.26
SIZE	5.19***	4.12	6.02***	5.30
M&A	0.28	0.31**	0.24	0.30**
n	29,994	1,331	10,832	320

Panel B: Comparison of Downward Switches versus Non-Switch Observations

	Pre-Enron		Post-Enron	
Variable	**Non-Switch**	**Switch**	**Non-Switch**	**Switch**
GROWTH	0.17***	−0.01	0.11**	0.05
ABSDACC	0.10	0.18***	0.09	0.15***
INVREC	0.31	0.34***	0.24	0.29***
GC	0.03	0.26***	0.03	0.18***
MODOP	0.29	0.34***	0.55***	0.43
TENURE	6.67***	4.30	6.71***	5.40
ROA	−0.03***	−0.34	−0.06***	−0.32
LOSS	0.31	0.76***	0.38	0.68***
LEVERAGE	0.23	0.29***	0.22	0.21
CASH	0.18	0.18	0.22	0.25***
MISMATCH	0.16	0.73***	0.18	0.70***
EXPERT	0.29***	0.20	0.32	0.31
SIZE	5.19***	2.29	6.02***	3.36
M&A	0.28***	0.12	0.24***	0.14
n	29,994	595	10,832	656

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*, **, *** Indicate variable is significantly greater than the corresponding value at the 10 percent, 5 percent, 1 percent levels, respectively, using two-tailed tests.

The Pre-Enron (Post-Enron) sample consists of firm-years during 1993–2001 (2002–2005). Panel A presents means for companies not switching Big N auditors (Non-Switch), companies switching laterally or upward to a Big N auditor (Switch), and tests of differences across the Non-Switch and Switch samples.

Panel B presents the corresponding information and comparisons for companies switching downward from a Big N auditor to a Non-Big N auditor.

(*continued on next page*)

TABLE 2 (continued)

Variable Definitions:

GROWTH = total assets less beginning total assets, divided by beginning total assets;
ABSDACC = absolute value of discretionary total accruals;
INVREC = inventory plus total receivables divided by total assets;
GC = 1 if the audit opinion is a going concern, and 0 otherwise;
MODOP = 1 if the audit opinion is modified for anything other than a going concern, and 0 otherwise;
TENURE = number of years audited by the incumbent auditor, with a maximum of 10 years;
ROA = net income before extraordinary items, divided by average total assets;
LOSS = 1 if *ROA* < 0, and 0 otherwise;
LEVERAGE = long-term debt divided by total assets;
CASH = cash divided by total assets;
MISMATCH = 1 if the client is mismatched with the incumbent auditor and 0 otherwise, calculated using the methodology in Shu (2000);
EXPERT = 1 if the incumbent auditor has at least 5 percent more clients in a particular industry and state than any other auditor, and 0 otherwise;
SIZE = natural logarithm of market value of equity; and
M&A = 1 if the client engaged in a merger or acquisition in the preceding two years, and 0 otherwise.

All non-indicator variables are winsorized at the 1 percent and 99 percent levels.

contains 1,331 (320) lateral/upward switches and 595 (656) downward switches in the pre- (post-) Enron period. The sample of non-switch observations includes all firm-years on Compustat with a Big N auditor in both the current and prior year (i.e., years t and $t-1$) that did not switch auditors (whether lateral, downward, or upward) within ±2 years, resulting in 29,994 (10,832) non-switch observations in the pre- (post-) Enron period. We winsorize all continuous variables at the 1 percent and 99 percent levels.

Panel A of Table 2 reveals that companies switching laterally/upward to a Big N auditor are more risky along several dimensions than the portfolio of Big N clients not switching auditors in the pre-Enron period (*GROWTH*, *ABSDACC*, *INVREC*, *GC*, *MODOP*, *TENURE*, *ROA*, *LOSS*, and *LEVERAGE*). In contrast, there are few significant differences in client risk factors in the post-Enron period, indicating clients switching laterally/upward are more similar to clients not changing Big N auditors. In both periods, companies switching laterally/upward are more likely to be misaligned with their incumbent auditor (*MISMATCH*). In untabulated analysis, we find that this difference in client misalignment is significant only for the subsample of companies switching upward.

As shown in Table 2, Panel B, companies switching downward to a lower-tier auditor are generally more risky than non-switching companies in both the pre- and post-Enron periods (*ABSDACC*, *INVREC*, *GC*, *TENURE*, *ROA*, and *LOSS*). Also as expected, *MISMATCH* is significantly higher for the switch sample in both periods, indicating that downward switching companies are realigning with lower-tier auditors. Overall, the univariate statistics reveal that clients switching downward are generally more risky and less aligned than clients maintaining their Big N auditor in both periods.[17]

Regression Analyses

Determinants of the Auditor Switch Decision

Table 3, Panel A, presents regression summary statistics for the estimation of the auditor switch model specified in Equation (1). We report separate coefficient estimates for the

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[17] In addition, untabulated findings indicate that *MISMATCH* is correlated with several audit and financial risk measures, although at relatively low levels; the highest correlation (in absolute terms) is 0.31. Because collinearity could affect our ability to draw inferences, we include an alternative specification in Section V that combines the several risk measures into two using factor analysis.

TABLE 3
Auditor Switch Model

$$SWITCH_{it} = \Sigma_I\, \alpha_I + \alpha_1 GROWTH_{it-1} + \alpha_2 ABSDACC_{it-1} + \alpha_3 INVREC_{it-1} + \alpha_4 GC_{it-1} + \alpha_5 MODOP_{it-1} + \alpha_6 TENURE_{it-1} + \alpha_7 ROA_{it-1} + \alpha_8 LOSS_{it-1} + \alpha_9 LEVERAGE_{it-1} + \alpha_{10} CASH_{it-1} + \alpha_{11} MISMATCH_{it-1} + \alpha_{12} EXPERT_{it-1} + \alpha_{13} SIZE_{it-1} + \alpha_{14} M\&A_{it-1} + \varepsilon_{it}$$

Panel A: Multinomial Logistic Regression Estimates

		Lateral/Upward Switches				**Downward Switches**		
Variable	**Predicted Sign**	**Pre-Enron**	**Post-Enron**	**Difference p-value**	**Predicted Sign**	**Pre-Enron**	**Post-Enron**	**Difference p-value**
GROWTH	?	0.32***	0.12	0.15	+	−0.30***	−0.06*	0.24
ABSDACC	?	0.49**	0.65	0.77	+	1.24***	0.65**	0.18
INVREC	?	0.10	0.19	0.83	+	−0.07	0.56**	0.09
GC	?	0.47***	−0.01	0.15	+	1.14***	0.76***	0.07
MODOP	?	0.29***	−0.14	0.00	+	0.61***	0.13	0.00
TENURE	?	−0.13***	−0.10***	0.06	−	−0.24***	−0.09***	0.00
ROA	?	−0.24**	0.28	0.08	−	−0.35***	−0.13	0.27
LOSS	?	0.35***	−0.27*	0.00	+	0.52***	0.21*	0.07
LEVERAGE	?	0.12	0.11	0.98	+	−0.09	−0.21	0.67
CASH	?	−0.70***	−0.52	0.66	−	−0.77***	−0.53**	0.50
MISMATCH	+	0.23***	−0.08	0.10	+	0.99***	1.26***	0.10
EXPERT	−	−0.34***	−0.33***	0.94	−	−0.35***	0.11	0.00
SIZE	?	−0.20***	−0.22***	0.57	−	−0.66***	−0.43***	0.00
M&A	?	0.20***	0.40***	0.17	?	−0.12	0.09	0.27
Pseudo R^2		0.23						

(continued on next page)

TABLE 3 (continued)

Panel B: Difference in Lateral/Upward and Downward Switch Coefficients

Variable	Predicted Sign	Pre-Enron	Post-Enron	Difference p-value
GROWTH	−	0.62***	0.19*	0.05
ABSDACC	−	−0.75**	0.00	0.27
INVREC	−	0.17	−0.37	0.32
GC	−	−0.68***	−0.78**	0.79
MODOP	−	−0.31***	−0.27*	0.80
TENURE	+	0.11***	−0.01	0.00
ROA	+	0.11	0.41	0.37
LOSS	−	−0.17	−0.47*	0.20
LEVERAGE	−	0.21	0.32	0.79
CASH	+	0.08	0.01	0.89
MISMATCH	−	−0.76***	−1.34***	0.02
EXPERT	?	0.02	−0.43***	0.03
SIZE	+	0.46***	0.21***	0.00
M&A	?	0.31**	0.31*	0.97

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*, **, *** Indicate significantly different from zero at the 10 percent, 5 percent, 1 percent levels, respectively, using two-tailed tests. p-values are for a χ^2 test of coefficient differences between the pre- and post-Enron periods.

Panel A presents coefficient estimates from a single multinomial regression with companies not changing Big N auditors in the Pre-Enron and Post-Enron periods, respectively, serving as the reference category. *SWITCH* equals 0, 1, and 2 for No Switch companies with a Big N auditor, Lateral/Upward switches, and Downward switches, respectively. The columns labeled "Difference" provide p-values for tests of differences in coefficients between the Pre-Enron and Post-Enron periods separately for companies with Lateral/Upward switches and Downward switches.

Panel B presents differences in coefficients between Lateral/Upward and Downward switches (Lateral/Upward coefficient − Downward coefficient from Panel A) within a particular period, as well as the p-values associated with the change in these differences between the periods.

See Table 2 for variable definitions and number of observations.

lateral/upward switches and downward switches for the pre- and post-Enron periods. The coefficients reflect sensitivity differences relative to the base case of no switch in Big N auditor. Within each switch category, Panel A presents p-values for tests of differences across periods in the columns labeled "Difference." Because the coefficient estimates indicate sensitivities relative to the no switch observations in each period, the tests of differences reveal whether these sensitivities change between periods.

The results show that lateral/upward switches are generally more sensitive to client risk than are non-switching companies in the pre-Enron period. In particular, high growth (*GROWTH*), greater discretionary accruals (*ABSDACC*), the issuance of a going concern or modified audit opinion (*GC* and *MODOP*), shorter client tenure (*TENURE*), poor financial performance (*ROA* and *LOSS*), and poor liquidity (*CASH*) all increase the likelihood of a company switching laterally/upward to a Big N auditor in the pre-Enron period. Client misalignment also plays a prominent role in lateral/upward switches in the pre-Enron period as clients that are mismatched with their incumbent auditor (*MISMATCH*) are significantly more likely to switch auditors. Untabulated findings indicate that this result is related to upward switches, as expected; the coefficient estimate on *MISMATCH* is not statistically significant when upward switches are excluded from the estimation, although all other inferences remain unchanged. Finally, the significant coefficient estimates on the control variables *EXPERT*, *SIZE*, and *M&A* indicate that companies without an industry expert auditor, smaller companies, and companies with merger and acquisition activity are more likely to switch laterally/upward to a Big N auditor in the pre-Enron period.

In contrast to the pre-Enron findings, companies switching laterally/upward in the post-Enron period are generally no more risky or misaligned than their non-switching counterparts. Of the client risk variables, only the coefficient estimate on *TENURE* maintains the same sign and is significant at conventional levels. Notably, the coefficient estimate on *LOSS* reverses sign in the post-Enron period; companies switching laterally/upward are less likely to have a loss than companies not switching Big N auditors. Similarly, in the post-Enron period the coefficient estimate on *MISMATCH* is insignificant.

Tests of differences in coefficients between the two periods provide additional evidence of a decline in the importance of client audit and financial risk as determinants of lateral/upward auditor switches. In particular, the *MODOP*, *TENURE*, *ROA*, and *LOSS* coefficients all decline significantly. The shift in risk coefficient estimates between the two periods can arise from either Big N auditors reassessing the desirability of taking on other Big N auditor's risky clients in light of the collapse of Andersen, i.e., an increase in sensitivity to risk, or the availability of better aligned former Andersen clients. Evidence presented below relating to downward switches can help determine which explanation is more descriptive. Finally, the significant difference in the *MISMATCH* coefficients between the two periods indicates the sensitivity of Big N auditors to client misalignment in lateral/upward switches declined in the post-Enron period. The flood of newly available Andersen clients and the additional capacity constraint arising from SOX 404 are possible explanations for this finding.

Regarding downward switches, the findings in Table 3, Panel A for the pre-Enron period are consistent with the prediction that switching to a non-Big N auditor is more likely for risky or misaligned clients. Specifically, the coefficients on the audit risk variables *ABSDACC*, *GC*, and *MODOP* are significantly positive and that on *TENURE* is significantly negative. The coefficients on the financial risk variables *ROA*, *LOSS*, and *CASH* are also consistent with the prediction that a downward switch is more likely for risky clients.[18] Similarly, the coefficient estimate on *MISMATCH* reveals that downward switches are significantly more likely for clients that are mismatched with their incumbent auditor.

Contrary to the prediction that there is an increase in risk sensitivity in the post-Enron period, four client risk coefficients decrease significantly for downward switches (*GC*, *MODOP*, *TENURE*, *LOSS*), while only one increases (*INVREC*). Taken at face value, these findings contradict the conclusion drawn in the GAO (2006) report that Big N auditors are more sensitive to client risk in the post-Enron period.[19] Results for client misalignment reveal a significant increase in the sensitivity of downward-switching firms to *MISMATCH*, indicating that clients misaligned with their incumbent Big N auditor are more likely to switch to a non-Big N auditor in the post-Enron period.

Overall, the findings for downward switches showing a general decrease in sensitivity to client risk and an increase in sensitivity to client misalignment are consistent with Big N auditors responding to the post-Enron capacity constraints arising from the Andersen supply shock and the SOX 404 demand shock. That is, the supply/demand shocks triggered by the collapse of Enron resulted in a higher cost of misalignment relative to the cost of client risk. As a result, the absorption of relatively low-risk Andersen clients for alignment reasons masks any potential increase in Big N audit firms' sensitivities to client risk in the post-Enron period. If risk sensitivity increased and the increase is permanent, then risk coefficients estimated using data subsequent to our sample period should increase as the effects of the supply and demand shocks diminish. We leave this issue to future research.

Table 3, Panel B, reports coefficient differences between lateral/upward switches and downward switches in the pre- and post-Enron periods. Panel B also reports p-values for changes in coefficient differences between the two periods. The tests of changes in coefficient sensitivities between periods likely suffer from a loss of power arising from differencing metrics that have estimation error (Landsman and Magliolo 1988; Barth et al. 2008). As a result, we do not expect many significant differences, but recognize any statistical difference is strong evidence of a change in sensitivities.

As predicted, downward switches are more likely than lateral/upward switches for risky clients in the pre-Enron period, as evidenced by the significant coefficient differences for *ABSDACC*, *GC*, *MODOP*, and *TENURE*. Findings are generally similar in the post-Enron period, although there is no longer a significant difference between lateral/upward and downward switches for *ABSDACC* and *TENURE*, and downward switches are significantly more sensitive to *LOSS*. The change in coefficient differences reported in the last column is insignificant for all but two of the risk variables. The significant change in the *TENURE* coefficient differences indicates that auditor tenure is a significantly less important risk factor in distinguishing between lateral/upward and downward switches in the post-Enron period, while the change in coefficient differences for *GROWTH* is difficult to interpret because the sign of the coefficient difference in each period is opposite to predictions.

Taken together, the client risk results in Table 3 show there is a reduced sensitivity to client risk for both lateral/upward and downward switches in the post-Enron period, but companies switching downward are still modestly more risky than those switching laterally/upward. This evidence is informative in light of the GAO's (2006) conclusion that the Big N have become more selective regarding risky clients based on their comparison of downward and lateral switches in the post-Enron period. The GAO analysis, however, does not examine pre-Enron auditor switches or compare the risk sensitivity of lateral/upward and downward switches between the pre- and post-Enron periods. Our results indicate that although downward switches are more risky than lateral/upward switches in the post-Enron period, the importance of client risk as a determinant of switching behavior declined for *both* downward and lateral/upward switches in the post-Enron period.

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[18] The coefficient on *GROWTH* is significantly negative, however, indicating that higher growth and thus, presumably, riskier clients are less likely to switch downward.

[19] The analysis in the GAO (2006) report is limited to those clients that switch laterally or downward from a Big N auditor in the post-Enron period. Hence, the report's conclusions are valid only when comparing lateral and downward switches. The dismissal-resignation model analysis we discuss below is thus most comparable to the analysis in the GAO (2006) report because the analysis is performed only on the subset of clients switching auditors. However, the dismissal-resignation model is a multivariate analysis whereas all of the GAO (2006) report analyses are univariate.

Finally, as expected, there is a significant negative coefficient difference for *MISMATCH* in both the pre- and post-Enron periods, indicating that downward switches are more likely than lateral/upward switches for clients misaligned with their incumbent auditor. Moreover, the coefficient difference declines from −0.76 in the pre-Enron period to −1.34 in the post-Enron period, a change that is significantly different from zero. These findings indicate the sensitivity to client misalignment increased for downward-switching firms relative to lateral/upward-switching firms in the post-Enron period. Considering that tests of changes in coefficient differences are relatively noisy, as discussed above, this is strong evidence that client misalignment played a more significant role in auditor switch behavior in the post-Enron period than in the pre-Enron period.

Dismissals versus Resignations

Table 4 presents regression summary statistics for downward-switching firms from the estimation of the dismissal-resignation model specified in Equation (2). This analysis is limited to clients switching auditors, with lateral/upward dismissals serving as the reference category.[20] As expected, the findings in Panel A indicate that in the pre-Enron period, resignations resulting in a downward switch are generally more sensitive to client risk characteristics than are dismissals resulting in a downward switch. For downward dismissals, only the coefficients on *ABSDACC*, *GC*, *TENURE*, and *REPEVENTS* are significant in the predicted direction. In contrast, for downward resignations not only are the coefficients on these variables significant, but also those on *MODOP*, *ROA*, *CASH*, and *DISAGREE*. Tests of coefficient differences in Panel B reveal that downward resignations are significantly more sensitive than downward dismissals to *GC*, *ROA*, and *CASH*.

Relative to the pre-Enron period, findings for the post-Enron period reveal few significant differences in the sensitivity of resignations and dismissals to client risk. Specifically, in the post-Enron period the *LOSS* coefficient increases significantly for downward resignations while the *INVREC* coefficient increases significantly for downward dismissals. The latter finding is surprising because we expect an increase in sensitivities to manifest for downward resignations, not dismissals. Sensitivities to the remaining client risk variables do not increase significantly in the predicted direction for either dismissals or resignations. Tests of coefficient differences in Panel B reveal that downward resignations are significantly more sensitive than downward dismissals to *GC*, *LOSS*, and *REPEVENTS*. Finally, with the exception of *LOSS*, the last column of Panel B indicates that changes between periods in risk coefficient differences for dismissals and resignations are insignificant.

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[20] Untabulated results reveal that lateral/upward resignations are more likely to be companies with going-concern opinions, accounting disagreements, or reportable events in the pre-Enron period. In contrast, none of the coefficient estimates is statistically significant at the 5 percent level in the post-Enron period, and only one coefficient (*MODOP*) is significantly different between the two periods. Given the relatively small sample of lateral/upward resignations in the post-Enron period, we hesitate to make strong conclusions, but in general, the lack of significant risk characteristics in the post-Enron period is consistent with findings reported in Table 3.

TABLE 4
Dismissal-Resignation Model

$$RESIGN/DISMISS_{it} = \Sigma_I\, \alpha_I + \alpha_1 GROWTH_{it-1} + \alpha_2 ABSDACC_{it-1} + \alpha_3 INVREC_{it-1} + \alpha_4 GC_{it-1} + \alpha_5 MODOP_{it-1} + \alpha_6 TENURE_{it-1} + \alpha_7 ROA_{it-1} + \alpha_8 LOSS_{it-1} + \alpha_9 LEVERAGE_{it-1} + \alpha_{10} CASH_{it-1} + \alpha_{11} DISAGREE_{it-1} + \alpha_{12} REPEVENTS_{it-1} + \alpha_{13} MISMATCH_{it-1} + \alpha_{14} EXPERT_{it-1} + \alpha_{15} SIZE_{it-1} + \alpha_{16} M\&A_{it-1} + \varepsilon_{it}$$

Panel A: Multinomial Logistic Regression Estimates for Downward Switches

		Dismissals			Resignations		
Variable	Predicted Sign	Pre-Enron	Post-Enron	Difference p-value	Pre-Enron	Post-Enron	Difference p-value
GROWTH	+	−0.68***	−0.23	0.05	−0.52***	−0.13	0.11
ABSDACC	+	0.78*	−0.19	0.28	1.18**	0.26	0.33
INVREC	+	−0.35	0.89*	0.04	−1.32***	−0.28	0.16
GC	+	0.56***	0.66	0.83	1.36***	1.30***	0.91
MODOP	+	0.21	0.12	0.72	0.46**	0.29	0.58
TENURE	−	−0.04*	−0.04	0.94	−0.08***	−0.01	0.10
ROA	−	−0.09	−0.20	0.78	−0.58**	−0.20	0.41
LOSS	+	0.11	0.13	0.95	0.09	0.83**	0.03
LEVERAGE	+	−0.11	−0.29	0.72	−0.65*	−0.66	0.99
CASH	−	−0.02	0.59	0.33	−0.87*	0.73	0.03
DISAGREE	+	−0.01	−0.03	0.97	0.67*	0.51	0.78
REPEVENTS	+	0.54*	0.78***	0.57	0.78**	1.34***	0.22
MISMATCH	+	0.86***	1.33***	0.05	0.76***	0.85***	0.76
EXPERT	−	0.22	0.47**	0.35	−0.24	0.39	0.06
SIZE	−	−0.65***	−0.40***	0.00	−0.46***	−0.31***	0.09
M&A	?	−0.58***	−0.41*	0.59	−0.08	−0.30	0.53
n		405	435		190	221	
Pseudo R^2		0.46					

(continued on next page)

TABLE 4 (continued)

Panel B: Difference in Dismissal and Resignation Coefficients

Variable	Predicted Sign	Pre-Enron	Post-Enron	Difference p-value
GROWTH	−	−0.16	−0.10	0.79
ABSDACC	−	−0.40	−0.45	0.95
INVREC	−	0.98**	1.18**	0.76
GC	−	−0.80***	−0.64**	0.67
MODOP	−	−0.24	−0.16	0.79
TENURE	+	0.04	−0.02	0.10
ROA	+	0.50**	0.00	0.15
LOSS	−	0.03	−0.70***	0.03
LEVERAGE	−	0.54	0.37	0.73
CASH	+	0.85*	−0.14	0.12
DISAGREE	−	−0.68	−0.54	0.81
REPEVENTS	−	−0.24	−0.56**	0.25
MISMATCH	?	0.10	0.44**	0.43
EXPERT	?	0.46*	0.08	0.22
SIZE	+	−0.19***	−0.09	0.27
M&A	?	−0.50*	−0.10	0.29

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*, **, *** Indicate significantly different from zero at the 10 percent, 5 percent, 1 percent levels, respectively, using two-tailed tests. p-values are for a χ^2 test of coefficient differences between the pre- and post-Enron periods.

Panel A presents coefficient estimates from a single multinomial regression with Lateral/Upward switches in the Pre-Enron and Post-Enron periods, respectively, serving as the reference category. *RESIGN/DISMISS* equals 0, 1, 2, and 3 for Lateral/Upward dismissals, Lateral/Upward resignations, Downward dismissals, and Downward resignations, respectively. The columns labeled "Difference" provide p-values for tests of differences in coefficients between the Pre-Enron and Post-Enron periods separately for Downward Dismissals and Downward Resignations. Predicted signs in Panel A are for both dismissals and resignations.

Panel B presents differences in coefficients between Downward Dismissals and Downward Resignations (Dismissal coefficient − Resignation coefficient from Panel A) within a particular period, as well as the p-values associated with the change in these differences between the periods.

Variable Definitions:

DISAGREE (*REPEVENTS*) = 1 if there is a disagreement (reportable event) as defined by the SEC in the auditor switch disclosures, and 0 otherwise.

See Table 2 for all other variable definitions.

Regarding client misalignment, findings in Table 4, Panel A indicate that *MISMATCH* is significant in the predicted direction for both downward dismissals and resignations in the pre-Enron period. Moreover, for downward dismissals, there is a significant increase in the importance of client misalignment in the post-Enron period. Panel B shows that the difference in *MISMATCH* between downward dismissals and resignations is significant only in the post-Enron period, but that the change between periods in the coefficient difference is insignificant.

Taken together, the findings in Table 4 indicate that the distinction between downward dismissals and resignations does not explain changes in Big N auditor switch behavior in the period surrounding the collapse of Enron. Thus, the changes in sensitivities to client risk in Table 3 appear not to be the result of changes in relative sensitivities of downward dismissals and resignations.

Pre- versus Post-SOX 404

The analyses of the auditor switch and dismissal-resignation models examine whether coefficient estimates differ between the pre- and post-Enron periods, and suggest that Big N auditors realigned their portfolios in response to the Andersen supply shock and the SOX 404 demand shock. To examine whether and to what extent each shock contributed to the overall capacity constraint, we separate the post-Enron period into pre-SOX 404 (2002–2003) and post-SOX 404 (2004–2005) subperiods.[21] The supply shock created by Andersen clients occurred primarily during 2002, but likely lingered into 2003. The SOX 404 demand shock potentially created an additional capacity constraint because of the increased auditing requirements related to internal control assessments.

Untabulated findings from estimating the auditor switch model indicate there are few coefficient differences between the two subperiods. However, the coefficient on *MISMATCH* decreases significantly from 1.26 in the pre-Sox 404 period to 0.69 in the post-Sox 404 period. Thus, the increased sensitivity to client misalignment in the post-Enron period documented in Table 3 is likely attributable to the initial Andersen supply shock rather than the later SOX 404 demand shock.

V. ALTERNATIVE SPECIFICATIONS OF THE AUDITOR SWITCH MODEL

In this section, we consider several alternative specifications of the auditor switch model that include different measures of client risk. In the discussion that follows, we contrast findings from these tests to our primary findings in Table 3 relating to downward switches. Taken together, findings from these alternative specifications do not alter the inferences we draw from the reported findings.

The first alternative specification collapses the audit risk variables (*GROWTH*, *ABSDACC*, *INVREC*, *GC*, *MODOP*, *TENURE*) and financial risk variables (*ROA*, *LOSS*, *LEVERAGE*, *CASH*) into two summary measures using factor analysis.[22] Combining the audit and financial risk variables in this fashion minimizes the degree to which collinearity among the risk variables could affect the ability of each to be significantly associated with auditor switches. Table 5, Panel A, presents the correlations of the underlying variables with their respective factor. Consistent with expectations and the results documented above, *AUDITRISK* increases with *GROWTH*, *ABSDACC*, *INVREC*, and *GC* and decreases with *TENURE*. Contrary to expectations, however, *MODOP* has a negative relation with

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[21] In accordance with the requirements of SOX 404, we classify observations with fiscal years ending after November 15, 2004 as post-SOX 404.

[22] The factor analysis indicates there are five factors with an eigenvalue greater than 1. We use the factor with the greatest eigenvalue for each set of variables.

TABLE 5
Summary Risk Measures and Downward Auditor Switches

Panel A: Factor Correlations

Variable	*AUDITRISK*	*FINANCIALRISK*
GROWTH	0.19	
ABSDACC	0.59	
INVREC	0.19	
GC	0.54	
MODOP	−0.67	
TENURE	−0.36	
ROA		−0.88
LOSS		0.89
LEVERAGE		0.11
CASH		0.41

Panel B: Multinomial Logistic Regression Results

		Downward Switches		
Variable	Predicted Sign	Pre-Enron	Post-Enron	Difference p-value
AUDITRISK	+	0.31***	0.20***	0.04
FINANCIALRISK	+	0.38***	0.09**	0.00
MISMATCH	+	0.85***	1.10***	0.10
EXPERT	−	−0.33***	0.07	0.01
SIZE	−	−0.70***	−0.47***	0.00
M&A	?	−0.15	0.05	0.27
Pseudo R^2		0.20		

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*, **, *** Indicate significantly different from zero at the 10 percent, 5 percent, 1 percent levels, respectively, using two-tailed tests. p-values are for a χ^2 test of coefficient differences between the pre- and post-Enron periods.

Panel A reports the correlations of the variables with their respective factor.

Panel B presents coefficient estimates for downward switches from a single multinomial regression with companies not changing Big N auditors in the pre-Enron and post-Enron periods respectively serving as the reference category.

Variable Definitions:
AUDITRISK (*FINANCIALRISK*) = first principle component from a factor analysis of the audit (financial) risk variables *GROWTH*, *ABSDACC*, *INVREC*, *GC*, *MODOP*, and *TENURE* (*ROA*, *LOSS*, *LEVERAGE*, and *CASH*).

See Table 2 for definitions of all other variables.

AUDITRISK. Nonetheless, given the alignment of the other five variables, we interpret increases in *AUDITRISK* as indicating greater audit risk. Similarly, consistent with expectations *FINANCIALRISK* decreases with *ROA* and increases with *LOSS* and *LEVERAGE*. Despite an unexpected positive correlation between *CASH* and *FINANCIALRISK*, the findings for the other variables suggest increases in *FINANCIALRISK* are consistent with greater financial risk.

We report the results for downward switches from the multinomial logistic regression using these two summary risk measures in Table 5, Panel B. The coefficient estimates on both *AUDITRISK* and *FINANCIALRISK* are significantly positive in the pre- and post-Enron periods. Moreover, both coefficients significantly decline across the periods, indicating the sensitivity to client risk has decreased in the post-Enron period. Findings for the remaining variables, including *MISMATCH*, are similar to those originally reported in Table 3. In additional untabulated analyses, we examine the change in coefficient differences as in Table 3, Panel B, and find as before an increased sensitivity to client misalignment for downward-switching firms relative to lateral/upward-switching firms in the post-Enron period (i.e., the difference p-value for *MISMATCH* = 0.01). Results for *AUDITRISK* and *FINANCIALRISK* are insignificant at conventional levels. Overall, the results are consistent with the findings in Table 3 showing a reduced sensitivity to client risk for both downward and lateral/ upward switches in the post-Enron period but an increased sensitivity to client misalignment in general and for downward-switching firms in particular.

The second alternative specification includes as an additional independent variable a measure of litigation risk based on the coefficient estimates in Shu (2000). Untabulated findings indicate that the litigation risk coefficient is significant in the pre-Enron period but not in the post-Enron period. These findings are consistent with auditors becoming less sensitive to litigation risk in the post-Enron period, although the change in coefficients across periods is not significantly different from zero. The results for resignations are similar to those for all downward switches.

The third alternative specification augments Equation (1) by including stock return volatility, which is a component of litigation risk included in the Shu (2000) summary measure. Consistent with predictions, the coefficient on volatility is positive in both the pre- and post-Enron periods. Although the coefficient decreases in the post-Enron period, the change is not significant.

The fourth alternative specification augments the model in Table 3 with a summary measure of the probability of bankruptcy based on Altman (1968) and in a separate regression a bankruptcy measure based on Ohlson (1980). The measures are constructed so that they increase as the probability of bankruptcy increases. In untabulated findings, we find these measures are generally positive, indicating the greater the probability of bankruptcy the greater the likelihood of switching downward. However, neither bankruptcy measure exhibits significant changes across time, and there is no change in inferences related to the other variables.

The fifth alternative specification replaces *CASH* with two other measures of liquidity risk: the current and quick ratios. In the pre-Enron period, the current ratio coefficient is negative and significant, while in the post-Enron period it remains negative but is no longer significant. Findings for the quick ratio coefficient are similar except it maintains its significance level in the post period. Neither set of coefficients exhibits significant changes across the pre- and post-Enron periods.

The sixth alternative specification replaces *ABSDACC*, the absolute value of discretionary accruals, with (1) the absolute value of total accruals and, alternatively, (2) performance-adjusted discretionary accruals (Kothari et al. 2005), where the coefficient is allowed to vary for positive and negative measures of this variable. Inferences relating to these alternative accruals variables are similar to those for *ABSDACC*.

Following Johnson and Lys (1990) and Shu (2000), our final specification includes changes in *ROA*, *LEVERAGE*, and *SIZE* in addition to their levels.[23] The coefficient on the change in *LEVERAGE* is positive and significant in both the pre- and post-Enron periods, but does not exhibit a significant difference across periods. The coefficients on the change in *ROA* and *SIZE* are not significantly different from zero and do not exhibit significant differences across periods. Overall, the robustness tests indicate the results are consistent across a variety of different specifications, all indicating the sensitivity to risk generally decreased while the sensitivity to misalignment increased.

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[23] These studies include the change variables in their models because they study auditor switches arising from endogenous changes in client or auditor characteristics rather than exogenous changes in the audit market as in our study.

VI. SUMMARY AND CONCLUSION

In this study, we examine empirically whether the sensitivity of Big N auditor switches to client risk and misalignment changed between the pre- and post-Enron periods. We find a decrease in the sensitivity to client risk and misalignment for lateral/upward switches in the post-Enron period. In addition, downward switches generally are significantly less sensitive to client risk and more sensitive to client misalignment in the post-Enron period. Together, these findings suggest that the observed changes in sensitivities to client risk and misalignment are attributable to a capacity constraint arising from the Andersen supply and SOX 404 demand shocks. In other words, the supply and demand shocks triggered by the collapse of Enron resulted in a higher cost of client misalignment relative to client risk. As a result, the absorption of relatively low-risk Andersen clients masks any potential increase in Big N audit firms' risk sensitivities in the post-Enron period.

Findings relating to analysis of dismissals and resignations indicate that resignations generally exhibit a greater sensitivity to client risk than dismissals in both the pre- and post-Enron periods. However, neither dismissals nor resignations show an increase in sensitivity to client risk in the post-Enron period, nor do the differences in sensitivities to client risk and misalignment change over time. Thus, the distinction between downward resignations and dismissals does not explain changes in Big N auditor switch behavior across the pre- and post-Enron periods.

Additional findings indicate that the SOX 404 demand shock did not affect the response of Big N auditors and clients incremental to their response to the Andersen supply shock. Because our sample period ends in 2005, we leave it to future research to determine whether the changes in the Big N audit market arising from the demand and supply shock capacity constraints are temporary or permanent.

APPENDIX
ESTIMATION OF CLIENT MISALIGNMENT

We follow the methodology in Shu (2000) to estimate the probability a firm is misaligned with its current auditor. Specifically, we estimate the following model separately for each year in the sample period, using all available observations from Compustat:

$$\begin{aligned} BigN_t = \alpha + \alpha_1 Size_t + \alpha_2 Acquisition_t + \alpha_3 ExFinance_t + \alpha_4 Profitability_t \\ + \alpha_5 MktBk_t + \varepsilon_t \qquad \text{(A1)} \end{aligned}$$

where the variables are defined as follows (Compustat data items in parentheses; all variables trimmed annually at the upper and lower 1 percent levels to reduce the influence of outliers):

BigN = 1 if the company had a Big N auditor, and 0 otherwise;[24]
Size = natural logarithm of total assets (#6);
Acquisition = acquisitions (#129) per the cash flow statement scaled by average total assets;
ExFinance = total debt (#111) and stock issuances (#108) per the cash flow statement scaled by average total assets;
Profitability = income before extraordinary items (#18) scaled by average total assets; and
MktBk = market value of equity (#25 × #199) scaled by book value of common equity (#60).

TABLE A1
Estimation of Client Misalignment

Panel A: Coefficient Estimate Summary Statistics from Annual Estimations of the Client Misalignment Model

Variable	Mean	Median	Std. Dev.
Intercept	−0.97	−0.77	0.55
Size	0.43	0.41	0.05
Acquisition	0.41	0.39	0.58
ExFinance	0.01	0.00	0.12
Profitability	−0.23	−0.22	0.11
MktBk	0.01	0.02	0.01

Panel B: Estimated Cut-Off Probabilities

Year	n	Estimated Cut-Off Probability
1991	4,508	0.85
1992	4,642	0.85
1993	5,011	0.87
1994	5,592	0.87
1995	6,139	0.86
1996	6,653	0.87
1997	6,777	0.87
1998	6,588	0.81
1999	6,509	0.79
2000	6,528	0.80
2001	6,153	0.75
2002	5,913	0.74
2003	5,607	0.74
2004	5,586	0.72
2005	4,837	0.74

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[24] Shu (2000) defines the dependent variable to include all "large" auditors, defined as Big N auditors and any auditor identified by an individual auditor code on Compustat. Because the purpose of our analysis is to determine whether the client is misaligned with a Big N auditor, we utilize the Big N/non-Big N designation as the dependent variable.

The coefficient estimates from this regression are utilized to estimate the probability of having a Big N auditor in a given year. The range of probabilities is divided into 20 intervals and the percentage of firms with Big N and non-Big N auditors within each interval is tabulated, providing a discrete approximation of the empirical distributions. The point at which the Big N and non-Big N auditor distributions cross is an estimate of the optimal cut-off level, i.e., the cut-off level, which minimizes the sample misclassification rates. That is, if the probability of having a Big N auditor falls below the optimal cut-off level, then the client is deemed to be misaligned with its Big N auditor that year. Panel A of Table A1 presents the mean, median, and standard deviation of the annual coefficient estimates over the 15-year sample period, while Panel B presents the resulting cut-off probabilities. The estimated cut-off probabilities are very similar to those in Shu (2000) in the years the samples overlap (1993–1996), suggesting the outputs of the estimations are comparable.

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Former Audit Partners on the Audit Committee and Internal Control Deficiencies

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ABSTRACT: This study examines the association between internal control deficiencies (ICDs) reported under Section 404 of the Sarbanes-Oxley Act (SOX, U.S. House of Representatives 2002) and the presence of former audit partners on the audit committee who are affiliated (AFAPs) and unaffiliated (UFAPs) with the firm's external auditor. We find a negative association between AFAPs and UFAPs on the audit committee and ICDs. We also find results that suggest the NYSE and NASDAQ three-year "cooling-off" rule applying to AFAPs may be unwarranted and deserves further empirical and regulatory attention. Further tests suggest AFAPs do not allow management to circumvent the disclosure of ICDs when conditions appear to suggest this may be so, and that AFAPs are negatively related to performance-adjusted discretionary accruals. Collectively, we interpret these findings to suggest that AFAPs and UFAPs on the audit committee are associated with more effective monitoring of internal controls and financial reporting.

Keywords: *audit committee; former partners; internal control; Sarbanes-Oxley.*

Data Availability: *Data are publicly available from the sources identified in the paper.*

I. INTRODUCTION

Since Section 407 of the Sarbanes-Oxley Act of 2002 (SOX, U.S. House of Representatives 2002) required issuers to disclose whether the audit committee is comprised of at least one financial expert, corporate boards have been assiduously recruiting CPA-qualified directors to the audit committee (Taub 2003, 2006).[1] However, post-SOX

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[1] Effective on March 3, 2003, Section 407 applies to fiscal years ending on or after July 15, 2003 (SEC 2003a).

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surveys (e.g., Williams 2005; Huron Consulting Group 2006) show that attracting CPA-qualified directors to audit committees is becoming elusive because of increased responsibilities and heightened professional and financial liability risks (Pryde 2002). Consequently, recruiting firms such as Spencer Stuart strongly recommend former partners of audit firms as prime candidates to serve on the audit committee as financial experts (e.g., Cytron 2005). Former audit partners (FAPs) are suitable candidates to enhance the effectiveness of the audit committee because they have many years of direct experience with, and expertise on, auditing internal controls and financial statements, along with diverse corporate and industry experience.

However, the potential benefits firms derive from the appointment of FAPs to the audit committee have been somewhat overshadowed by regulatory concerns on the practice of "revolving-door" appointments. Regulators are concerned that clients recruiting audit firm employees threatens the independence and objectivity of the oversight of the financial reporting process (Securities and Exchange Commission [SEC] 2000, 2001; Independence Standards Board [ISB] 2000). To maintain an independent and objective oversight process, the SOX Section 407 audit committee financial expert must be an independent director (SEC 2003a). While SOX does not directly address the appointment of former audit firm employees to a client's board, it directs the SEC to introduce rules that address director independence.

On November 3, 2003, the SEC approved the NYSE and NASDAQ rules tightening the definition of an independent director (SEC 2003b). These rules impose a three-year "cooling-off" period before a former audit firm employee is deemed independent and therefore able to serve on a client's board and subcommittee including the audit committee (NYSE Section 303A(2)(b)(iii); NASDAQ Rule 4200(a)(15)(F)). The NYSE and NASDAQ "cooling-off" rules became effective on November 4, 2004. The "cooling-off" rules suggest an "affiliated" FAP on the audit committee is not independent of management and, thus, undermines the objectivity and effectiveness of the audit committee's oversight of the financial reporting process.

Dissenting comments received by the SEC on the NYSE and NASDAQ three-year "cooling-off" rules argued that these rules unnecessarily deter suitably qualified candidates from accepting audit committee appointments (SEC 2003b). In the current business environment in which regulators are closely monitoring corporate activities with severe penalties for noncompliance, directors serving on audit committees have strong economic incentives, driven by reputation and litigation concerns, to effectively perform their responsibilities (Lennox and Park 2007). Despite these significant countervailing arguments, there is no empirical research focusing on how affiliated former audit firm employees serving on the audit committee influence the quality of the financial reporting process.

This study examines the association between the presence of affiliated former audit partners (AFAPs) and unaffiliated former audit partners (UFAPs) on the audit committee and material weaknesses in internal control that require disclosure under Section 404 of SOX (ICDs). To our knowledge, this is the first study to provide empirical evidence on how the monitoring function of the audit committee is affected by the presence of AFAPs and UFAPs on the audit committee. While prior studies have investigated the association between audit committee accounting expertise and ICDs (Bédard et al. 2006; Zhang et al. 2007), the definition of accounting expertise in these studies is broad and does not demarcate experts possessing considerable experience with internal controls from those without such experience. By focusing on UFAPs, we evaluate whether accounting experts with career-long experience with internal controls are more effective in overseeing internal controls over financial reporting (ICFR) than other types of experts with relatively less experience with internal controls.[2] Experimental research supports the view that audit partners possess superior understanding of ICDs and are better able to identify such deficiencies (Libby 1995). These findings and the fact that regulatory concerns on independence threats are not applicable to UFAPs suggests a negative association between the expertise possessed by UFAPs on the audit committee and ICDs.

However, the ability of AFAPs on the audit committee to oversee the effectiveness of ICFR is less clear. If the regulatory concerns about "revolving-door" appointments are legitimate, then one could question the objectivity and independence AFAPs exercise when overseeing ICFR. On the contrary, it is plausible that regulatory concerns are less applicable to the audit committee setting because audit committee members are sensitive to the possibility of affiliations threatening audit quality (Lennox and Park 2007). Even if the board believes there is no imminent threat, an AFAP may not be appointed unless there is full confidence that the affiliation presents no threat to the integrity of financial reporting. On balance, the ability of AFAPs, as members of the audit committee, to effectively monitor internal controls depends on whether their value-enhancing experience and knowledge override regulatory concerns that AFAPs threaten the objectivity and independence of the audit committee and its due processes. Despite the relevance of this issue to regulators, researchers, and practitioners, prior studies have largely concentrated on how financial reporting quality is affected by the recruitment of AFAPs as executive officers (Dowdell and Krishnan 2004; Menon and Williams 2004; Geiger et al. 2005; Lennox 2005; Geiger and North 2006).

Based on a sample of 1,225 firms making SOX Section 404 internal control disclosures for the 2004 fiscal year ending on or after November 14, 2004, we find evidence consistent with the view that the presence of AFAPs and UFAPs on the audit committee is associated with lower incidence of reported ICDs. We find no statistically significant difference between the effect of AFAPs and UFAPs on ICDs. These results are robust to different classification of ICDs based on: (1) Moody's Investors Service (2004), (2) SAS No. 109, and (3) Audit Analytics. Contrary to regulatory concerns, our tests also show a negative association between AFAPs appointed to the audit committee within three years of departing their audit firm and ICDs. We conduct further supplemental tests and find that FAPs affiliated with the current (CAFAPs) or former auditor (FAFAPs) are negatively associated with ICDs. Our results are robust to self-selection bias tests and additional corroborating analyses.

The negative association between AFAPs and ICDs could be interpreted as AFAPs creating a permissive environment in which management and auditors circumvent reporting ICDs even when such deficiencies are detected. We acknowledge that it is not possible to identify whether an audit committee detected a reportable ICD and elected not to disclose it. Therefore, following established procedures (e.g., Lennox 2005), we identify firms that are *ex ante* likely to experience ICDs in our sample, and then undertake an additional analysis focusing on these firms. Our results from this analysis are not consistent with the notion that the presence of AFAPs on the audit committee creates an environment conducive to circumventing the disclosure of ICDs in these firms. We corroborate these findings with results from a supplemental test showing that AFAPs are negatively associated with performance-adjusted discretionary accruals, a widely used proxy for the quality of financial reporting that takes into account the extent of discretion granted to management.

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[2] Generally, the scope of ICFR includes policies and procedures pertaining to the accuracy, authorization, completeness, and adequate maintenance and documentation of transactions, financial statement compliance with GAAP, and the prevention of unauthorized transactions. For details see PCAOB (2004, 2007).

Our findings contribute to the emerging literature on "revolving-door" appointments in at least four ways. First, our study is among the first to provide evidence on the financial reporting implications of "revolving-door" practices at the audit committee level; prior studies focus at the executive officer level. Second, our study evaluates the impact of "revolving-door" appointments on a specific component of the financial reporting process, namely effectiveness of ICFR. Although Kinney et al. (1990) emphasized the importance of ICFR in ensuring better quality financial reporting, research on the determinants of ICFR effectiveness has mainly gained momentum since the enactment of SOX (e.g., Krishnan 2005; Doyle et al. 2007). We extend this literature by examining the association between FAPs on the audit committee and the effectiveness of ICFR. Third, our study is the first to examine how the presence of an affiliated audit committee member within three years of departing the current or former audit firm is associated with the effectiveness of ICFR. Fourth, in contrast to prior studies, ours is among the first to provide post-SOX evidence on the financial reporting implications of "revolving-door" appointments. Our study is of relevance to regulators and policymakers because our evidence suggests that independence concerns on "revolving-door" appointments may not be warranted when such appointments are made to recruit audit committee members. Our results suggest that imposing restrictions such as the three-year "cooling-off" rule to appointing qualified and experienced experts like AFAPs to the audit committee inhibits the objective of SOX to enhance the audit committee's oversight of ICFR.

Section II provides background and discusses prior research. Section III describes the sample and research design. Section IV presents results of our primary tests, and Section V presents the results of additional tests. Section VI concludes the paper.

II. BACKGROUND AND PRIOR LITERATURE

Effective for fiscal years ending on or after November 15, 2004, Section 404 of SOX requires management of "accelerated filers"[3] to disclose in their annual report an assessment of the effectiveness of their firm's ICFR, and auditors to attest to the assessments made by management. If a material weakness in ICFR is identified, then management is required to disclose the identified material weakness.[4] Further, SOX empowers the audit committee to oversee and monitor management's implementation and assessment of ICFR as well as the external auditor's attestation of management's assessment. The intent of Section 404 is to strengthen a firm's ICFR so that the risk of financial misreporting is minimized.

Prior research suggests that audit committee members with professional accounting and auditing certification or other accounting-related work experience generally contribute more significantly to the effectiveness of the audit committee than members without such qualifications or experience (e.g., DeZoort and Salterio 2001; McDaniel et al. 2002; Agrawal and Chadha 2005; DeFond et al. 2005). In the context of ICD disclosures, research is quite clear that the presence of accounting experts on the audit committee is negatively associated with reported ICDs (Bédard at al. 2006; Zhang et al. 2007). These results support Section 407 of SOX that requires audit committee financial experts to possess *experience* with internal controls.[5] However, the definition of accounting expertise employed in prior internal control studies remains broad, and thus we do not know what background characteristics (financial accounting expertise and experience possessed by audit firm partners, CFOs, CEOs, and VP with and without CPA qualification, bankers, etc.) of directors on the audit committee are driving the results of prior research. Understanding this issue is important to inform policymakers, corporate boards, and researchers on the internal control monitoring skills possessed by various types of accounting experts on the audit committee. For instance, the many years of corporate experience possessed by CFOs in overseeing company performance qualifies them as accounting experts, despite evidence showing that most CFOs do not possess direct experience with auditing, designing, and implementing internal controls (Aier et al. 2005).

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[3] "Accelerated filers" include firms incorporated under American law with a common equity public float of at least $U.S.75 million, that have been subject to the Exchange Act reporting requirements for at least 12 months and have previously filed at least one annual report. Section 404 compliance for "non-accelerated filers" has been revised several times and the current compliance date is for fiscal years ending on or after December 15, 2007, with auditor attestation required for years ending on or after December 15, 2008 (SEC 2006).

[4] A material weakness in internal control is "a significant deficiency, or combination of significant deficiencies, that results in more than a remote likelihood that a material misstatement of the annual or interim financial statements will not be prevented or detected" (PCAOB 2004, Auditing Standard No. 2, para 10).

Experimental research indicates that experienced auditors are more adept than novice auditors at making control risk assessments and evaluating the reliability of internal controls (Frederick 1991; Tubbs 1992; Davis 1996; Curtis and Viator 2000). Consistent with this notion, evidence from nonaccounting research suggests that experienced decision makers are more proficient at identifying the appropriate judgment variables and recognizing the relationships among them (Anderson 1983; Johnson et al. 1984; Dreyfus and Dreyfus 1986). Since FAPs possess career-long professional experience with internal controls and the financial reporting process, we contend that, barring potential independence threats, FAPs are ideal candidates to serve on the audit committee. To the extent that experience functions as a proxy for internal control knowledge, the presence of UFAPs on the audit committee should increase the firm's likelihood of meeting various facets of internal control monitoring required in the post-SOX era, resulting in a lower likelihood of ICDs occurring.

Adverse Consequences of "Revolving-Door" Appointments

In light of the regulatory concerns on the practice of "revolving-door" appointments to the audit committee (SEC 2003b), it is not clear whether AFAPs can offer similar monitoring of ICFR like UFAPs. The primary concern centers on AFAPs not exercising independent and objective judgment prior to and following their appointment with the client (SEC 2003b). Regulators allege that such appointments contribute to financial misreporting and overrides of internal controls (Beasley et al. 2000; SEC 2001; Menon and Williams 2004; Geiger et al. 2005).[6]

The appointment of AFAPs to a current or past client's audit committee can impair the effectiveness of the audit committee's oversight of the ICFR for several reasons. First, during his/her tenure as an auditor of the client, the AFAP is likely to have developed close personal ties with a client's management and thus, as an "independent" member of the audit committee, may not challenge management's internal control procedures and financial reporting strategies. Second, the AFAP's intimate knowledge of the former audit firm's audit procedures and test design affords him/her opportunities to circumvent audit tests and thus influence the outcome of the audit. Third, the AFAP's association with his/her former audit firm may result in the audit team not challenging the AFAPs assertions and explanations. Finally, an independent director who is an AFAP may not possess the mental objectivity to effectively oversee the external audit process and terminate the auditor if necessary.

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[5] Section 407 was subject to significant criticisms because the restrictive definition severely limited the pool of available candidates (SEC 2003a; DeFond et al. 2005). In response, the SEC controversially adopted a less restrictive definition of a financial expert in its final rules, under which a financial expert on the audit committee is not required to have *experience* with internal controls but an *understanding* of internal controls (Section 401(h)(3) of Regulation S-K).

[6] Scandals at Enron, Cendant, Waste Management, and Global Crossing were partially attributed to "revolving-door" executive appointments (Geiger et al. 2008).

Such concerns culminated in the SEC approving the NYSE and NASDAQ director independence rules that prohibit FAPs from serving on the audit committee as an independent director unless, among other requirements, the individual was, within the prior three years, not associated with the firm's current or former auditor (SEC 2003b). These listing rules, effective November 4, 2004, permit a FAP to serve on the audit committee of a former client as an independent director after a three-year "cooling-off" period.

Potential Benefits of "Revolving-Door" Appointments

Imposing a restriction such as the three-year "cooling-off" period on AFAPs could also run counter to the intention of SOX, as these potential audit committee candidates possess years of relevant experience with the financial reporting process. The ISB (2000) holds the view that AFAPs joining a client bring considerable experience and expertise to the financial reporting process. The ISB (1999, para. 13) believes that "limiting the ability of companies to hire qualified people will, in some cases, reduce the quality of financial reporting." There are several major benefits for appointing AFAPs to the audit committee.

First, AFAPs have significant knowledge about a client's internal business processes, company structure, internal control systems including the internal audit function, and internal and external financial reporting practices. Accordingly, they are able to more efficiently and effectively perform their oversight role as an independent audit committee member relative to those without such knowledge. Second, as a specialized and experienced auditor in a client's industry, AFAPs possess valuable economic, industry, and market knowledge that provide useful resources to the company and are valued by the market (e.g., Ferguson et al. 2003; Francis et al. 2005). Such knowledge will assist AFAPs to better identify and assess inherent risks, and oversee the design, implementation, and operation of ICFR. Third, AFAPs have intricate knowledge of the audit firm's quality control procedures, and their personal association with the client engagement team may help foster candid discussions on contentious issues and mediate between management and the auditor. Independent directors who are AFAPs are likely to support the independent external auditor not only because they are independent of management (e.g., Carcello and Neal 2003), but also because they have confidence in the external auditor's judgments.

Prior Research on "Revolving-Door" Practices

Historically, empirical research on the financial reporting consequences of "revolving-door" practices is quite recent with a paucity of published studies. While Menon and Williams (2004) find that firms hiring "affiliated" FAPs as officers report significantly greater abnormal accruals than firms that do not, the evidence is mixed for directors. Dowdell and Krishnan (2004) and Lennox (2005) also document greater abnormal accruals in firms appointing former audit firm employees as executives and officers. However, Geiger et al. (2005) and Geiger and North (2006) do not report greater abnormal accruals surrounding the period immediately prior to or following the hiring of senior financial executive officers (CFOs, VP-finance, controller) from their audit firm. Moreover, Geiger et al. (2008) show that market participants react positively to the recruitment of former audit firm employees as accounting and finance officers.

However, as there is no prior post-SOX study on FAPs on the audit committee, be they affiliated or non-affiliated, we do not know if and how their presence on the audit committee is related to audit committee effectiveness. By examining the association between the presence of UFAPs and AFAPs on the audit committee and ICDs, this study assesses the contribution UFAPs make to the effectiveness of the audit committee, and whether the contribution is any different in the case of AFAPs. As discussed earlier, we expect the presence of UFAPs on audit committees to be negatively associated with ICDs. However, we form no expectations about the presence of AFAPs on the audit committee and ICDs. Regulatory concerns over independence threats suggest a positive association between AFAPs on the audit committee and ICDs. In contrast, the years of client-specific and non-client-specific experience and expertise possessed by AFAPs suggest a negative association between AFAPs on the audit committee and ICDs.

III. SAMPLE AND RESEARCH DESIGN

Sample

Panel A of Table 1 outlines the sample selection procedure. We begin with 8,464 firms with data coverage on the Compustat database for the 2004 fiscal year. Under SOX Section 404, managers of "accelerated filers" are required to report an assessment of ICFR for

TABLE 1
Sample Derivation and Industry Membership

Panel A: Sample Derivation

	Firms
Original sample obtained from Compustat	8,464
Less firms with unavailable data on Audit Analytics	5,340
	3,124
Less firms with unavailable data on Board Analyst	1,503
	1,621
Less banks and financial institutions	320
	1,301
Less firms with missing information	76
Final Test Sample	1,225

Panel B: Industry Membership of Sample

	Total Sample		*NOPROB* Sample		*CTPROB* Sample	
Industry (SIC)	n	%	n	%	n	%
Mining and Construction (10–17)	75	6.12	65	86.67	10	13.33
Manufacturing (20–39)	580	47.34	507	87.41	73	12.59
Transportation and Utilities (40–49)	180	14.69	164	91.11	16	8.89
Wholesale and Retail (50–59)	167	13.63	135	80.84	32	19.16
Services (70–89)	216	17.63	184	85.19	32	14.81
Other	7	0.57	6	85.71	1	14.29
Total	1,225		1,061	86.72	164	13.28

years ending on or after November 15, 2004. The Audit Analytics database provides coverage for SEC registrants that disclose their assessments of ICFR in electronic filings since November 2004. We identify 3,124 firms filing Section 404 reports for the 2004 fiscal year from Audit Analytics. We then delete (1) firms without corporate governance and biographical data on directors in the Board Analyst database (1,503 firms), (2) banks and financial institutions (320 firms in SIC 6000–6999),[7] and firms with missing data required for deriving our dependent and independent variables (76 firms). Our final sample therefore comprises 1,225 firms.

Panel B of Table 1 shows the industry membership of our sample. To facilitate comparison with prior research on internal controls, our industry definitions are consistent with Krishnan (2005). When we split our sample into firms that report ICDs (*CTPROB*) and firms that report no such deficiencies (*NOPROB*), the descriptive statistics suggest that firms in the wholesale and retail (transportation and utilities) industry are most (least) likely to experience ICDs. Approximately 19.16 (8.89) percent of the sample from the wholesale and retail (transportation and utilities) industry report ICDs.

Empirical Model and Variables

We employ logistic regression to model the probability of a material ICD over financial reporting as a function of AFAPs and UFAPs on the audit committee and control variables. Our logistic regression is specified as follows:

$$\begin{aligned} ICPROB = f\{&AFFPART, NONAFFPART, SPECACCTG, POTACCTG,\\ &FINANCE, SUPER, ACSIZE, ACIND, ACMEET, BDIND,\\ &DUALITY, FRAUD, SIZE, GROWTH, LOSS, SWITCHES,\\ &GEOSEG, FOROP, LEVRG, INVAR, SPITEMS, INDUSTRY\}. \end{aligned} \tag{1}$$

Dependent Variable: Internal Control Deficiency

The Audit Analytics database offers a wide variety of data from Section 404 internal control reports, including whether the registrant's ICFR were effective, and if not, the types of deficiencies identified. Consistent with prior research, the internal control measure employed in our main analysis (*ICPROB*) equals 1 if a firm experiences a material ICD as disclosed in the audit report, and 0 otherwise.

Test Variables: Affiliated and Unaffiliated Former Audit Partners

To evaluate the central premise of this study, our test independent variables, *AFFPART* and *NONAFFPART*, capture the presence of AFAPs and UFAPs on audit committees, respectively.[8] *AFFPART* (*NONAFFPART*) is coded 1 if the audit committee includes at least one member who is a former partner affiliated (unaffiliated) with a current/past auditor of the firm, and 0 otherwise.[9] We search and scrutinize the background of 4,519 audit committee directors on Audit Analytics, Board Analyst, and company websites to determine their classification into AFAP, UFAP, and other categories of financial expertise described next.

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[7] One of the long-standing requirements of the Federal Deposit Insurance Act of 1991 is for large financial institutions to maintain and report annual assessments of their internal control structure, and the external auditor to examine and attest to management's assertions concerning the effectiveness of the firm's internal controls.

[8] Consistent with prior studies, we exclude individuals who have served as partners in the management advisory services unit of an auditing firm. Our results are unaffected by the inclusion of these individuals.

[9] Our results are unchanged when we replicate our analyses after employing alternative measures that capture (1) the number of UFAPs and AFAPs on the audit committee, (2) percentage of audit committee members who are UFAPs and AFAPs, and (3) using a dichotomous specification for these variables but only after considering the background of the SOX Section 407 designated financial expert(s), if any.

Control Variables: Other Financial Expertise

We control for two types of accounting expertise that are not captured by *AFFPART* and *NONAFFPART.* First, to differentiate audit committee members who are FAPs from non-FAP members with specific accounting expertise gained through CPA certification or public accounting experience, we introduce a variable, *SPECACCTG,* which equals 1 if the audit committee includes at least one non-FAP member with specific accounting expertise, and 0 otherwise.[10] Second, we control for the presence of members with potential accounting experience obtained from positions such as CFOs, controllers or vice-president of finance, by introducing a variable, *POTACCTG,* that equals 1 if the audit committee includes at least one member with experience in such positions, and 0 otherwise.[11]

In addition to accounting expertise, DeFond et al. (2005), Carcello et al. (2006), Dhaliwal et al. (2006), and Zhang et al. (2007) suggest that individuals with finance and supervisory expertise can enhance the financial reporting process. We include these types of expertise because the SEC and the national stock exchanges define financial expertise to include any experience in supervising employees with financial responsibilities and overseeing the performance of companies (SEC 2003a). *FINANCE* (*SUPER*) equals 1 if the audit committee includes at least one member with finance (supervisory) expertise, and 0 otherwise.[12]

Panel A of Table 2 defines our FAP and expertise measures and states their expected association with ICDs. Given that audit committee financial expertise is expected to reduce the incidence of ICDs (e.g., Krishnan 2005; Bédard et al. 2006; Krishnan and Visvanathan 2006; Zhang et al. 2007), we expect a negative association between *NONAFFPART* (and our four expertise control variables) and *ICPROB.* Due to the contrasting views on the value of having AFAPs serve on audit committees, we offer no predictions for the association between *AFFPART* and *ICPROB.*

Additional Control Variables

Our additional control variables capture other governance and firm characteristics that potentially affect internal control quality. Panel B of Table 2 defines these variables and their expected association with ICDs. First, we control for other governance characteristics that could impact ICDs. We control for the size of the audit committee (*ACSIZE*), audit committee independence (*ACIND*), and the number of audit committee meetings held during the fiscal year (*ACMEET*), because they are negatively associated with ICDs (e.g., Krishnan 2005; Zhang et al. 2007).[13] Since the board of directors plays an important role over ICFR (Beasley 1996; Farber 2005; Krishnan 2005), we control for the proportion of nonaudit committee board members who are independent (*BDIND*), and whether the CEO is also

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[10] We acknowledge we could extend our analysis by examining the affiliation status of non-partner-level audit firm employees on the audit committee. However, in most cases there is no information available on the affiliation status of these directors.

[11] We choose to control for *SPECACCTG* and *POTACCTG* separately instead of using an aggregated measure as recent evidence indicates that some work experiences classified as accounting expertise in prior research (e.g., CFOs) are not necessarily associated with professional accounting backgrounds (Aier et al. 2005; Krishnan 2005).

[12] Consistent with the prior literature (e.g., DeFond et al. 2005; Dhaliwal et al. 2006), finance expertise includes work experience as investment bankers, financial analysts, venture capitalists, or any other financial management roles, while supervisory expertise involves work experience as chief executive officers or company presidents.

[13] We measure *ACIND* as the proportion of independent directors on the audit committee. We obtain qualitatively similar results if *ACIND* is coded 1 if all directors on the audit committee are independent, and 0 otherwise.

TABLE 2
Variable Definitions

Panel A: Test and Other Financial Expertise Control Variables

Variable Name	Predicted Sign	Variable Measurement
AFFPART	?	1 if the audit committee includes at least one member who is a former partner affiliated with a current/past auditor of the firm, and 0 otherwise (Board Analyst).
NONAFFPART	–	1 if the audit committee includes at least one member who is a former partner with no previous affiliations with a current/past auditor of the firm, and 0 otherwise (Board Analyst).
SPECACCTG	–	1 if the audit committee includes at least one member who has specific accounting experience as a CPA or in public accounting, and 0 otherwise (Board Analyst).
POTACCTG	–	1 if the audit committee includes at least one member who has work experience as a chief financial officer, vice-president of finance, controller, and 0 otherwise (Board Analyst).
FINANCE	–	1 if the audit committee includes at least one member who has work experience as an investment banker, financial analyst, venture capitalist, or any other financial management roles, and 0 otherwise (Board Analyst).
SUPER	–	1 if the audit committee includes at least one member who has work experience as a chief executive officer or company president, and 0 otherwise (Board Analyst).

Panel B: Control Variables

Variable Name	Predicted Sign	Variable Measurement
ACSIZE	–	1 if the size of the audit committee is larger than the sample median, and 0 otherwise (Board Analyst).
ACIND	–	Proportion of audit committee members who are independent (Board Analyst).
ACMEET	–	1 if the number of audit committee meetings held was more than the median number of meetings held across the full sample, and 0 otherwise (Proxy statement).
BDIND	–	Proportion of board members, excluding audit committee members, who are independent (Board Analyst).
DUALITY	+	1 if the CEO of the firm is also the board chairman, and 0 otherwise (Board Analyst).
FRAUD	+	1 if there is an SEC action against the firm, or any restatement of its financial statements, and 0 otherwise (Board Analyst).
SIZE	–	Natural log of total assets (Compustat item 6).
GROWTH	?	One year growth in sales (Compustat item 12).
LOSS	+	1 if the firm reports a loss in the fiscal year, and 0 otherwise (Compustat item 172).
SWITCHES	+	1 if the firm switches auditor in the current or previous fiscal year, and 0 otherwise (Audit Analytics).
GEOSEG	+	Natural log of the number of reported geographical segments (Compustat Segment File).
FOROP	+	1 if the firm reports foreign currency adjustments, and 0 otherwise (Compustat item 150).
LEVRG	+	Debt to total assets ratio (Compustat item 181/Compustat item 6).

(*continued on next page*)

TABLE 2 (continued)

Variable Name	Predicted Sign	Variable Measurement
INVAR	+	Inventory plus accounts receivable scaled by total assets ([Compustat item 2 + Compustat item 3]/Compustat item 6).
SPITEMS	+	Special items scaled by total assets (Compustat item 17/Compustat item 6).

the board chairman (*DUALITY*). We expect a negative (positive) association between *BDIND* (*DUALITY*) and ICDs. Following Krishnan (2005), we capture the overall integrity of firm management by controlling for firms that are facing SEC actions or restatements of its financial statements due to GAAP violations (*FRAUD*). *FRAUD* is expected to be positively associated with ICDs.

Next, we control for several non-governance firm characteristics that, according to prior research, are expected to be positively related to the incidence of ICDs (Ge and McVay 2005; Krishnan 2005; Zhang et al. 2007; Ashbaugh-Skaife et al. 2007; Doyle et al. 2007). More specifically, these variables include loss during the fiscal year (*LOSS*), auditor change in the current or previous year (*SWITCHES*), number of geographical segments (*GEOSEG*), whether the firm reports foreign currency adjustments (*FOROP*), financial leverage (*LEVRG*), proportion of assets carried as receivables and inventory (*INVAR*), and special items (*SPITEMS*). We also control for firm size (*SIZE*), as larger firms are less likely to encounter ICDs (Kinney and McDaniel 1989; DeFond and Jiambalvo 1991; Doyle et al. 2007). While we control for firm growth (*GROWTH*), we do not form any expectations about its association with ICDs due to the ambiguous findings reported in prior studies (Kinney and McDaniel 1989; Krishnan 2005). Finally, we control for the impact of industry characteristics by introducing industry indicator variables (*INDUSTRY*).[14]

IV. RESULTS

Descriptive Statistics and Univariate Analyses

Panel A of Table 3 reports descriptive statistics on the test and other audit committee financial expertise variables for the sample firms with (*CTPROB*) and without (*NOPROB*) ICDs. The descriptive statistics for *AFFPART* indicate that a greater proportion of *NOPROB* firms (mean = 0.07) have at least one AFAP on their audit committee, as compared to *CTPROB* firms (mean = 0.03). This difference is statistically significant ($p < 0.01$). The descriptive statistics for *NONAFFPART*, *SPECACCTG*, *POTACCTG*, and *FINANCE* are not significantly different between the two subsamples. Our result for *SUPER* is surprising, as it indicates that firms with audit committees comprising directors with supervisory expertise are more likely to experience ICDs ($p < 0.10$).

Panel B of Table 3 reports the summary statistics for the control variables. Consistent with expectations, we find that firms with larger audit committees (*ACSIZE*) are less likely to experience ICDs ($p < 0.05$). Surprisingly, our statistics for *ACIND* and *ACMEET* indicate that *CTPROB* firms have a higher proportion of independent audit committee members ($p < 0.10$ using parametric tests), and hold more audit committee meetings ($p < 0.01$). These

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[14] Our results are insensitive to the inclusion of additional control variables such as multiple-directorships, share ownership, board size, board meetings, Big N auditor, auditor specialization, auditor tenure, stock issues, stock exchange listing, number of operating segments, Zmijewski's financial distress score, and mergers and acquisitions.

TABLE 3
Descriptive Statistics by Firms With and Without Internal Control Deficiencies

Panel A: Descriptive Statistics on Audit Committee Financial Expertise Variables

	CTPROB **Sample[a] (n = 164)**		***NOPROB*** **Sample[a] (n = 1,061)**		**Test of Differences**		
Variable	**Mean**	**Median**	**Mean**	**Median**	**Expected Sign**	**t-statistic**	**Wilcoxon Z**
AFFPART	0.030	0.000	0.069	0.000	?	−2.46***	−1.87**
NONAFFPART	0.098	0.000	0.123	0.000	−	−0.99	−0.91
SPECACCTG	0.369	0.000	0.381	0.000	−	−0.37	−0.37
POTACCTG	0.518	1.000	0.507	1.000	−	0.27	0.27
FINANCE	0.372	0.000	0.402	0.000	−	−0.75	−0.74
SUPER	0.909	1.000	0.871	1.000	−	1.52*	1.36*

Panel B: Descriptive Statistics on Control Variables

	CTPROB **Sample[a] (n = 164)**		***NOPROB*** **Sample[a] (n = 1,061)**		**Test of Differences**		
Variable	**Mean**	**Median**	**Mean**	**Median**	**Expected Sign**	**t-statistic**	**Wilcoxon Z**
ACSIZE	0.415	0.000	0.493	0.000	−	−1.89**	−1.87**
ACIND	0.944	1.000	0.925	1.000	−	1.50*	1.09
ACMEET	0.567	1.000	0.464	0.000	−	2.48***	2.47***
BDIND	0.486	0.500	0.464	0.500	−	0.58	0.04
DUALITY	0.591	1.000	0.594	1.000	+	−0.06	−0.06
FRAUD	0.232	0.000	0.147	0.000	+	2.43***	2.76***
SIZE	11.808	11.676	12.180	12.037	−	−2.85***	−3.33***
GROWTH	0.097	0.089	0.179	0.120	?	−4.61***	−3.21***
LOSS	0.488	0.000	0.333	0.000	+	3.69***	3.84***
SWITCHES	0.189	0.000	0.119	0.000	+	2.18**	2.50***
GEOSEG	2.381	2.000	2.189	2.000	+	2.57***	2.37***
FOROP	0.402	0.000	0.272	0.000	+	3.19***	3.42***
LEVRG	0.619	0.565	0.539	0.530	+	2.55***	2.42***
INVAR	0.281	0.266	0.234	0.210	+	3.27***	3.50***
SPITEMS	0.026	0.006	0.015	0.003	+	2.36**	2.54***

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

[a] *CTPROB* sample consists of firms that disclose material deficiencies in their internal control over financial reporting quality. *NOPROB* sample consists of firms that do not report any internal control deficiencies.

See Table 2 for variable definitions.

results are probably due to independent directors of firms with ICDs meeting more frequently to debate financial reporting and internal control matters. Board independence (*BDIND*) and CEO-chairman duality roles (*DUALITY*) are not significantly different between the *CTPROB* and *NOPROB* subsamples. The remaining control variables are statistically significantly ($p < 0.05$) different between the two subsamples. *CTPROB* firms are more likely to experience SEC actions or restatements (*FRAUD*), be smaller in size (*SIZE*), experience lower sales growth (*GROWTH*), and experience financial stress (*LOSS*). *CTPROB* firms are also more likely to experience recent auditor switches (*SWITCHES*), be geographically dispersed (*GEOSEG*), and have foreign operations (*FOROP*). Finally, *CTPROB* firms are more highly levered (*LEVRG*), have more receivables and inventory (*INVAR*), and report more special items (*SPITEMS*).

Multivariate Analyses

Table 4 reports Pearson and Spearman correlation matrices. While there are a number of significant correlations, they are not sufficiently large to pose multicollinearity threats. The highest variance inflation factor of 3.023 (untabulated) is well below the threshold of 10 beyond which multicollinearity may be a problem (Kennedy 1992).

Table 5 presents the results from the logistic regression of the incidence of ICDs (*ICPROB*) on the test and control variables. Coefficients for industry indicator variables are not reported. The results indicate a significant negative association between: (1) *ICPROB* and *AFFPART* ($p = 0.021$), and (2) *ICPROB* and *NONAFFPART* ($p = 0.044$). These results suggest that firms with AFAPs and UFAPs on their audit committees are less likely to report ICDs. A test of differences between the coefficients on *AFFPART* and *NONAFFPART* (not tabulated) shows the two coefficients are not significantly different (Wald Chi-square $= 0.739$, $p = 0.390$). The results for the control variables indicate that *ACSIZE*, *SIZE*, and *GROWTH* are negatively associated with the incidence of ICDs ($p = 0.045$, 0.020, and 0.003, respectively). Furthermore, we find that the incidence of ICDs is positive and significantly ($p < 0.05$) associated with a large number of control variables including *ACMEET*, *FRAUD*, *LOSS*, *SWITCHES*, *GEOSEG*, *FOROP*, *LEVRG*, *INVAR*, and *SPITEMS*. Such observations are generally consistent with the prior literature.

Our results suggest that the ability of the audit committee members to oversee ICFR in the post-SOX era appear to be dependent upon them possessing the most extensive type of accounting and auditing knowledge and experience (i.e., partner-level accounting expertise). The result for AFAPs suggests that, while the hiring of affiliated partners as executive officers may create the appearance of lack of independence and may lead to a deterioration in financial reporting quality (Dowdell and Krishnan 2004; Menon and Williams 2004; Lennox 2005), such concerns are unlikely to prevail when AFAPs serve as audit committee members. Our results are generally consistent with those of Geiger and North (2006), who find no adverse effects of "revolving-door" CFO appointments on discretionary accruals.

V. ADDITIONAL TESTS

Specific Types of Internal Control Deficiencies

To test the sensitivity of our overall findings, we replicate our analysis in Table 5 using specific types of ICDs. First, consistent with Raghunandan and Rama (2006) and Doyle et al. (2007), we classify the ICDs into two mutually exclusive groups according to Moody's Investors Service (2004) and replicate our logistic regression analyses. Moody's, a bond-rating company, classifies material ICDs into one of two categories: Type A, or Type B. Type A deficiencies relate to material weaknesses in internal controls over account-specific balances or transaction-level processes. According to Moody's, these are less severe control problems because auditors can conduct alternative tests to ascertain that account balances and disclosures are fairly stated. For example, where the auditor detects inadequate controls for accounting for inventory obsolescence, the auditor can conduct alternative (substantive) tests to address the valuation assertion. Type B deficiencies relate to company-level problems such as the quality of accounting personnel or the control environment and are considered more serious, as auditors are less able to effectively address such weaknesses during

TABLE 4

Correlations: Pearson (Spearman) Correlations are Presented in the Upper (Lower) Diagonal[a]

	AFFPART	*NONAFFPART*	*SPECACCTG*	*POTACCTG*	*FINANCE*	*SUPER*	*ACSIZE*	*ACIND*	*ACMEET*	*BDIND*	*DUALITY*
AFFPART		**−0.065**	**0.334**	0.009	−0.014	−0.034	−0.044	−0.010	0.005	**−0.069**	**−0.063**
NONAFFPART	**−0.065**		**0.471**	0.004	−0.032	−0.045	−0.017	−0.007	**0.128**	0.039	−0.044
SPECACCTG	**0.334**	**0.471**		**0.091**	−0.044	**−0.069**	0.011	−0.034	**0.069**	−0.017	−0.042
POTACCTG	0.009	0.004	**0.091**		0.006	−0.013	0.014	0.002	**0.064**	**0.060**	**−0.059**
FINANCE	−0.014	−0.032	−0.044	0.006		−0.043	0.025	−0.011	0.053	−0.008	**−0.056**
SUPER	−0.034	−0.045	**−0.069**	−0.013	−0.043		**0.140**	0.044	−0.022	**0.078**	0.046
ACSIZE	−0.044	−0.017	0.011	0.014	0.025	**0.140**		**0.058**	−0.014	**0.059**	**0.077**
ACIND	−0.019	−0.003	−0.032	0.003	−0.020	0.052	0.034		0.036	0.051	0.016
ACMEET	0.005	**0.128**	**0.069**	0.064	0.053	−0.022	−0.014	0.045		0.026	−0.011
BDIND	−0.055	0.033	−0.023	0.024	−0.042	**0.096**	**0.087**	**0.085**	0.034		0.009
DUALITY	**−0.063**	−0.044	−0.042	**−0.059**	**−0.056**	0.046	**0.077**	0.021	−0.011	0.052	
FRAUD	−0.003	0.027	0.002	−0.025	−0.015	−0.013	−0.007	0.008	0.011	−0.009	0.008
SIZE	−0.054	−0.012	−0.017	**−0.066**	−0.005	**0.171**	**0.336**	−0.008	**0.069**	**0.158**	**0.148**
GROWTH	0.007	−0.020	0.004	0.012	**0.060**	−0.036	−0.030	−0.049	−0.011	**−0.097**	**0.061**
LOSS	−0.011	−0.009	0.002	−0.016	0.000	−0.001	−0.056	**0.068**	0.050	0.026	**−0.113**
SWITCHES	0.030	−0.028	0.008	−0.009	−0.003	−0.011	**−0.067**	−0.015	−0.019	−0.019	−0.006
GEOSEG	−0.002	−0.020	−0.038	0.005	0.030	0.033	**0.074**	0.043	−0.013	**0.112**	0.029
FOROP	−0.019	0.032	0.013	0.034	**0.061**	−0.032	0.035	0.041	−0.024	0.050	−0.006
LEVRG	−0.044	0.017	0.007	−0.040	−0.037	**0.108**	**0.240**	0.044	**0.062**	**0.153**	**0.078**
INVAR	0.052	0.001	0.025	0.012	**−0.068**	−0.021	0.004	0.056	−0.034	0.030	0.009
SPITEMS	−0.027	0.028	−0.027	−0.029	**0.063**	0.047	0.024	0.029	**0.061**	**0.079**	**−0.090**

(*continued on next page*)

TABLE 4 (continued)

	FRAUD	*SIZE*	*GROWTH*	*LOSS*	*SWITCHES*	*GEOSEG*	*FOROP*	*LEVRG*	*INVAR*	*SPITEMS*
AFFPART	−0.003	−0.053	0.003	−0.011	0.030	0.004	−0.019	−0.022	0.052	−0.019
NONAFFPART	0.027	−0.012	0.002	−0.009	−0.028	−0.015	0.032	−0.006	−0.007	0.055
SPECACCTG	0.002	−0.010	−0.005	0.002	0.008	−0.024	0.013	−0.009	0.043	0.016
POTACCTG	−0.025	**−0.073**	0.029	−0.016	−0.009	0.003	0.034	−0.034	−0.011	−0.024
FINANCE	−0.015	−0.010	0.048	0.000	−0.003	0.026	**0.061**	−0.033	**−0.061**	−0.005
SUPER	−0.013	**0.170**	−0.052	−0.001	−0.011	0.024	−0.032	**0.087**	−0.017	0.037
ACSIZE	−0.007	**0.338**	−0.023	−0.056	−0.067	**0.081**	0.035	**0.151**	0.005	−0.024
ACIND	0.000	0.012	−0.017	0.054	−0.013	0.035	0.055	0.033	0.051	−0.023
ACMEET	0.011	**0.064**	0.034	0.050	−0.019	−0.006	−0.024	0.028	−0.019	0.051
BDIND	0.009	**0.140**	−0.029	0.043	−0.016	**0.085**	**0.064**	0.023	0.009	0.030
DUALITY	0.008	**0.151**	−0.018	**−0.113**	−0.006	0.028	−0.006	0.053	0.010	**−0.093**
FRAUD		−0.042	0.033	0.043	0.028	**0.116**	0.033	−0.033	0.015	−0.013
SIZE	−0.048		−0.022	**−0.097**	**−0.084**	**0.117**	0.054	**0.240**	**−0.189**	**−0.075**
GROWTH	0.021	−0.041		0.002	−0.003	0.024	0.003	**−0.091**	0.008	−0.028
LOSS	0.043	**−0.092**	**−0.112**		−0.044	**0.107**	**0.110**	**0.182**	−0.056	**0.184**
SWITCHES	0.028	**−0.089**	−0.002	−0.044		0.031	0.008	0.027	−0.036	−0.012
GEOSEG	**0.109**	**0.102**	**0.102**	**0.096**	0.032		**0.346**	**−0.061**	0.050	−0.011
FOROP	0.033	0.043	0.035	**0.110**	0.008	**0.389**		−0.003	0.021	0.015
LEVRG	−0.019	**0.430**	**−0.181**	**0.152**	0.008	−0.055	−0.015		−0.008	**0.169**
INVAR	0.006	**−0.213**	**0.081**	**−0.068**	−0.027	**0.123**	**0.064**	−0.033		−0.020
SPITEMS	−0.009	0.043	**−0.141**	**0.293**	−0.037	**0.105**	**0.120**	**0.195**	**−0.072**	

[a] Correlations significant at the two-tailed 0.05 level are in bold figures.

See Table 2 for variable definitions.

TABLE 5
Logistic Regression Results

Variable	Expected Sign	Estimate	p-value
Intercept	?	−2.721	0.009***
AFFPART	?	−1.184	0.021**
NONAFFPART	−	−0.693	0.044***
SPECACCTG	−	0.206	0.174
POTACCTG	−	0.045	0.403
FINANCE	−	−0.074	0.345
SUPER	−	0.484	0.058*
ACSIZE	−	−0.333	0.045**
ACIND	−	0.589	0.179
ACMEET	−	0.532	0.002***
BDIND	−	0.157	0.316
DUALITY	+	0.107	0.283
FRAUD	+	0.511	0.011**
SIZE	−	−0.148	0.020**
GROWTH	?	−1.315	0.003***
LOSS	+	0.366	0.029**
SWITCHES	+	0.489	0.022**
GEOSEG	+	0.349	0.002***
FOROP	+	0.558	0.003***
LEVRG	+	0.604	0.019**
INVAR	+	1.276	0.018**
SPITEMS	+	2.834	0.041**
Industry indicators		included	
Observations		1,225	
Pseudo R^2		0.16	
χ^2		111.67***	

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively.
The p-values are one-tailed for variables with an expected sign, and two-tailed otherwise.
See Table 2 for variable definitions.

the audit. For example, a Type B deficiency such as senior management overriding internal controls is difficult to detect, and if detected, is usually addressed by the auditor through discussions with management and possibly the audit committee. The results from these regressions are reported in the third and fourth columns of Panel A in Table 6. For the sake of brevity, we do not report the parameter estimates of the control variables, since these estimates are qualitatively similar to those reported in Table 5.

The results in Panel A of Table 6 indicate a significant negative association between AFAPs (*AFFPART*) and Type A ($p < 0.10$), and Type B ($p < 0.05$) ICDs. We find that UFAPs (*NONAFFPART*) are negatively associated ($p < 0.05$) with Type B deficiencies only. Since Type A ICDs occur at the transaction level and are relatively more client-specific than Type B ICDs that occur at the control environment level, our results imply AFAPs possess more appropriate expertise and experience than UFAPs. Prior client experience

TABLE 6
Regression Results for Alternative Measures of Internal Control Deficiencies

Panel A: Regression Results for Moody's and SAS No. 109 Classification of Internal Control Deficiencies[a]

		Moody's Classification		SAS No. 109 Classification			
Variable	Expected Sign	Type A	Type B	*CTRL ENV*	*CTRL ACT*	*INFO SYS*	*CTRL MON*
AFFPART	?	−0.855	−1.359	−1.196	−1.274	−0.108	−0.831
		*0.098**	*0.040***	*0.062**	*0.026***	*0.907*	*0.074**
NONAFFPART	−	−0.430	−0.942	−1.009	−1.376	−0.555	−0.389
		0.166	*0.032***	*0.034***	*0.003****	*0.244*	*0.158*
SPECACCTG	−	0.109	0.244	0.132	0.242	0.223	0.188
		0.359	*0.196*	*0.329*	*0.178*	*0.332*	*0.239*
POTACCTG	−	−0.021	0.085	0.030	0.065	0.522	−0.119
		0.466	*0.366*	*0.453*	*0.387*	*0.125*	*0.293*
FINANCE	−	−0.119	0.023	−0.073	−0.059	0.225	−0.025
		0.317	*0.463*	*0.389*	*0.397*	*0.335*	*0.455*
SUPER	−	0.074	0.916	1.067	0.692	1.325	0.132
		0.422	*0.032***	*0.025***	*0.047***	*0.135*	*0.354*
Other Control Variables		included	included	included	included	included	included
Observations		1,225	1,225	1,225	1,225	1,225	1,225
Pseudo R^2		0.13	0.17	0.15	0.22	0.09	0.11
χ^2		63.91***	87.52***	73.82***	131.5***	63.94***	66.15***
No. of ICD Observations		81	84	76	107	27	104

(*continued on next page*)

TABLE 6 (continued)

Panel B: Regression Results for Audit Analytics Classification of Internal Control Deficiencies[b]

Variable	Expected Sign	Audit Analytics (AA) Classification				AA Factor Analysis	
		ACCTG DOC	*ACCTG PERS*	*MAT YE ADJ*	*RST FILING*	*ACCTG INFOSYS*	*RESTATE*
AFFPART	?	−1.096	−1.177	−1.612	−0.816	−1.176	−0.816
		*0.034***	*0.065**	*0.020***	*0.078**	*0.022***	*0.078**
NONAFFPART	−	−0.730	−1.032	−1.472	−0.516	−0.704	−0.516
		*0.019***	*0.031***	*0.003****	*0.097**	*0.021***	*0.097**
SPECACCTG	−	0.180	0.223	0.259	0.230	0.234	0.230
		0.210	*0.231*	*0.176*	*0.194*	*0.143*	*0.194*
POTACCTG	−	0.065	0.003	0.106	−0.073	0.043	−0.073
		0.362	*0.495*	*0.332*	*0.370*	*0.408*	*0.370*
FINANCE	−	−0.021	−0.119	0.030	−0.027	−0.082	−0.027
		0.455	*0.328*	*0.452*	*0.453*	*0.329*	*0.453*
SUPER	−	0.418	1.004	0.517	0.057	0.466	0.057
		*0.087**	*0.033***	*0.109*	*0.436*	*0.065**	*0.436*
Other Control Variables		included	included	included	included	included	included
Observations		1,225	1,225	1,225	1,225	1,225	1,225
Pseudo R^2		0.15	0.15	0.24	0.12	0.16	0.12
χ^2		102.14***	74.54***	132.44***	66.38***	111.48***	66.38***
No. of ICD Observations		157	72	93	101	162	101

(*continued on next page*)

TABLE 6 (continued)

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

The first row in each cell reports the coefficient estimate and the second row reports the p-value (in italics), where p-values are one-tailed for variables with an expected sign, and two-tailed otherwise.

[a] Moody's Type A = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material internal control deficiency at transaction level, and 0 otherwise; Moody's Type B = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material internal control deficiency at company level, and 0 otherwise; SAS No. 109 *CTRL ENV* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material internal control deficiency in its control environment, and 0 otherwise; SAS No. 109 *CTRL ACT* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material internal control deficiency in its control activities, and 0 otherwise; SAS No. 109 *INFO SYS* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material internal control deficiency in its information and communication systems, and 0 otherwise; SAS No. 109 *CTRL MON* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material internal control deficiency in its control monitoring, and 0 otherwise.

[b] AA *ACCTG DOC* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material accounting documentation related internal control deficiency, and 0 otherwise; AA *ACCTG PERS* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material accounting personnel related internal control deficiency, and 0 otherwise; AA *MAT YE ADJ* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material year-end adjustment deficiency, and 0 otherwise; AA *RST FILING* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material restatement of filings, and 0 otherwise; AA *ACCTG INFOSYS* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material internal control deficiency related to either accounting documentation, accounting personnel, information systems, material year-end adjustments, segregation of duties or account reconciliation, and 0 otherwise; and AA *RESTATE* = measures the dependent variable as a dichotomous variable coded 1 if the firm experiences a material restatement of filings or previous internal control reports, and 0 otherwise.

See Table 2 for variable definitions.

appears to strengthen the AFAP's ability to ensure that ICFR are operating effectively at both the transaction and control environment levels.

Second, we apply our logistic regression analyses to four alternative dependent variables that capture ICDs related to the four internal control components outlined in SAS No. 109: control environment, control activities, information and communication, and control monitoring. In these supplemental analyses, we allow firms to have multiple types of ICDs. The results, reported in the last four columns of Panel A in Table 6, indicate that AFAPs are negatively associated with ICDs relating to control activities ($p < 0.05$), control environment ($p < 0.10$), and control monitoring ($p < 0.10$). We also find that UFAPs are negatively associated with control activities ($p < 0.01$) and control environment ($p < 0.05$) related deficiencies.

Third, we classify ICDs according to disclosures made under Section 404, as reported by Audit Analytics. The Audit Analytics database classifies ICDs into 18 types. We find that only four of these deficiency types are prominent in our sample (>50 occurrences): accounting documentation, accounting personnel, material year-end adjustment, and restatement of filings. We replicate our analysis four more times using dependent variables that capture these four specific types of ICDs. The results from these analyses, reported in columns three to six of Panel B in Table 6, indicate that both *AFFPART* and *NONAFFPART* are negative and significantly associated with these four specific types of ICDs.

Finally, we perform a Varimax-rotated factor analysis of the Audit Analytics classified ICDs, which indicates that the ICDs load on two factors that account for 44.34 percent of the total variance. We label these two factors (1) AA *ACCTG INFOSYS* and (2) AA *RESTATE*. We then repeat our logistic regression analysis twice more after employing dependent variables that capture the occurrences of ICDs that are classified into the AA *ACCTG INFOSYS* and AA *RESTATE* groups. The results reported in the last two columns of Panel B in Table 6 show that *AFFPART* and *NONAFFPART* are negative and significantly associated with the two groups of ICDs. Results from Wald Chi-square tests (not tabulated) do not indicate a significant difference ($p > 0.10$) between the coefficients on *AFFPART* and *NONAFFPART* across all results reported in Table 6.

AFAPs Appointed Within or After a Three-Year "Cooling-Off" Period

In this section, we consider how our results are affected if AFAPs are appointed within or after three years of leaving the audit firm. For our sample, all FAPs were appointed to the audit committee before the "cooling-off" rules became effective.[15] Thus, we are able to test the potential implications of the "cooling-off" rules.

We replicate our regression analysis in Table 5 after replacing the variable *AFFPART* with two dichotomous variables, *NCOOLAFFPART* and *COOLAFFPART*, that capture AFAPs appointed to the audit committee within and after three years since the partner's departure from the audit firm, respectively. The results from this analysis, reported in the third column of Table 7, indicate that *NCOOLAFFPART* and *COOLAFFPART* are negatively associated with ICDs ($p = 0.044$ and 0.098, respectively). A coefficient difference test (not tabulated) indicates these two coefficients are not significantly different (Wald Chi-square = 0.84; $p = 0.36$). In addition, the coefficients on *NCOOLAFFPART* and *COOLAFFPART* are not significantly different from the coefficient on *NONAFFPART* (Wald Chi-square = 1.289; $p = 0.256$ and Wald Chi-square = 0.057; $p = 0.811$, respectively).

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[15] The most recent appointment of an AFAP in our sample was made in 2003. In our sample of 78 firms with AFAPs, 48 firms appointed AFAPs who met the "cooling-off" rule and 30 firms appointed AFAPs who did not meet the "cooling-off" rule.

TABLE 7
Logistic Regression Results for Three-Year "Cooling-Off" Rule and Specific Types of Affiliations

Variable	Expected Sign	Cooling Off	Specific Affiliations
Intercept	?	−2.487 *0.014***	−2.716 *0.009****
NCOOLAFFPART	?	−1.824 *0.044***	
COOLAFFPART	?	−0.739 *0.098**	
CRNTAFFPART	?		−1.353 *0.037***
FMRAFFPART	?		−1.035 *0.062**
NONAFFPART	−	−0.588 *0.045***	−0.697 *0.021***
SPECACCTG	−	0.019 *0.467*	0.207 *0.172*
POTACCTG	−	0.076 *0.341*	0.042 *0.408*
FINANCE	−	−0.087 *0.346*	−0.073 *0.346*
SUPER	−	0.030 *0.436*	0.481 *0.059**
Other Control Variables		included	included
Observations		1,225	1,225
Pseudo R^2		0.16	0.16
χ^2		109.26***	111.70***

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

The first row in each cell reports the coefficient estimate and the second row reports the p-value (in italics) where p-values are one-tailed for variables with an expected sign, and two-tailed otherwise.

NCOOLAFFPART = 1 if the audit committee includes at least one member who is an affiliated accounting partner who joined the firm less than three years after leaving the auditing firm, and 0 otherwise; *COOLAFFPART* = 1 if the audit committee includes at least one member who is an affiliated accounting partner who joined the firm three years after leaving the auditing firm, and 0 otherwise; *CRNTAFFPART* = 1 if the audit committee includes at least one member who is a former accounting partner affiliated with the current auditor of the firm, and 0 otherwise; and *FMRAFFPART* = 1 if the audit committee includes at least one member who is a former accounting partner affiliated with a past auditor of the firm, and 0 otherwise.

See Table 2 for remaining variable definitions.

Our results suggest that the appointment of an AFAP who does not meet the "cooling-off" rule appears to enhance the audit committee's oversight of ICFR. Such AFAPs are equally effective as AFAPs who meet the "cooling-off" rule and UFAPs. Accordingly, the "cooling-off" rules imposed by the NYSE and NASDAQ may be unwarranted, deserving further attention from regulators and researchers. Our results support DeFond and Francis (2005), who argue that regulators hastily introduced SOX-driven regulations without sufficient and persuasive evidence.

Specific Types of AFAPs

As discussed earlier, our measure of affiliation is based on any affiliation of a FAP with the firm's current or former auditor. To evaluate whether our results are driven by a particular type of affiliation, we replicate the regression analysis in Table 5 after replacing the variable *AFFPART* with two dichotomous variables, *CRNTAFFPART* (n = 46) and *FMRAFFPART* (n = 32), that represent FAPs affiliated with the firm's current and former auditor, respectively. The results from this analysis, reported in the last column of Table 7, indicate that *CRNTAFFPART* and *FMRAFFPART* are negatively associated with ICDs (p = 0.037 and 0.062, respectively). Wald Chi-square tests (not tabulated) do not indicate a significant difference between the coefficients on: *CRNTAFFPART* and *FMRAFFPART* (Wald Chi-square = 0.105; p = 0.746), *CRNTAFFPART* and *NONAFFPART* (Wald Chi-square = 0.691; p = 0.406), and *FMRAFFPART* and *NONAFFPART* (Wald Chi-square = 0.216; p = 0.642). We earlier offered three possible reasons why AFAPs might impair the effectiveness of the audit committee. Two of these reasons relate to AFAPs' familiarity with (1) the audit procedures of the current auditor, and (2) the members of the current engagement team. Both of these possible reasons for impairment are addressed somewhat by documenting the similar results obtained for partners who are represented by the variables *FMRAFFPART*, *CRNTAFFPART*, and *NONAFFPART*. Our results suggest that partners affiliated with the current auditor are just as effective in monitoring internal controls as are partners affiliated with a former auditor, or unaffiliated partners.

We also replicate our analysis after replacing the FAP-current auditor affiliation variable (*CRNTAFFPART*) with three variables capturing the three types of current auditor affiliations identified by Lennox (2005); employment (n = 27), alma-mater (n = 12), and chance (n = 7) affiliation. While the results (not tabulated) from this extension indicate that the coefficients on all three current auditor affiliation variables are negative, they are statistically insignificant. The lack of statistical significance likely reflects the small sample of the three types of FAP-current auditor affiliations.

CEO Influence on AFAPs

Another possible reason for an AFAP impairing the effectiveness of the audit committee is when the AFAP has close personal ties with management. We evaluate this possibility by investigating if the current CEO potentially influenced the appointment of the AFAP to the audit committee. This analysis is initiated by developing a new variable, *CEO_INFL*, which equals 1 if the tenure of the CEO is greater than or equal to the tenure of the AFAP. We empirically test the CEO's influence on the AFAPs monitoring effectiveness by including an interaction term (*CEO_INFL* × *AFFPART*) in our regression analysis in Table 5. A positive and significant coefficient on *CEO_INFL* × *AFFPART* would suggest that the CEO's influence over the appointment of the AFAP to the audit committee impairs the independence of the AFAP's monitoring of ICFR. Our untabulated results from this analysis show a significant negative association between *ICPROB* and *AFFPART* (p = 0.094). The coefficient on *CEO_INFL* × *AFFPART* is not significant (p = 0.241), suggesting no incremental effect of a "CEO influenced" AFAP on ICDs.

As a further test, we also examine the influence of a powerful CEO (*DUALITY*) on the association between AFAPs and ICDs. We undertake an analysis similar to the above and find that *AFFPART* continues to have a significant negative association with *ICPROB* (p = 0.054), while the coefficient on the interaction between *DUALITY* and *AFFPART* is not significant (p = 0.380).

While the issue of impairment examined in our study mostly relates to AFAPs, we also replicate the analyses in this subsection for UFAPs. Our results relating to CEO influence over UFAPs are qualitatively similar to those reported above for AFAPs. Our results relating to a CEO's influence over AFAPs and UFAPs do not support the notion that FAPs, and in particular, AFAPs may impair the effectiveness with which the audit committee oversees the internal controls when the CEO has had a role in appointing the partner or serves as the board chairman.

Alternative Explanation Test

Consistent with the prior literature, we interpret the negative coefficient on *AFFPART* from our main analysis as evidence that AFAPs on the audit committee are effective monitors of the internal control environment. However, an alternate interpretation of this finding is that the presence of AFAPs creates a permissive environment, under which they collude with management and elect to not disclose reportable ICDs.

To evaluate whether the presence of AFAPs affords management greater discretion over the disclosure of ICDs, we replicate our analysis in Table 5 with a two-step analysis. In the first step, we estimate Equation (1) after eliminating our two test variables and the four expertise variables. From the estimate of Equation (1), we obtain and rank firms' predicted probability of an ICD (*PREDICD*) to identify firms with *PREDICD* that places them in the top 20 percent and create a new variable, *LIKELYICD*. *LIKELYICD* is coded 1 for firms in the top 20 percent, and 0 otherwise. In the second step, we regress ICDs (*ICPROB*) on *LIKELYICD*, the main effects of the test (and expertise) variables, and the interaction effects between test (and expertise) variables and *LIKELYICD*. A significant negative coefficient on the interaction between *LIKELYICD* and *AFFPART* will indicate that firms with characteristics that would normally deserve ICDs are less likely to disclose reportable ICDs when they have an AFAP on their audit committee. The results from the second-step analysis, reported in the third column of Table 8, indicate that the interaction effect of *LIKELYICD* and *AFFPART* is positive and not statistically significant. This implies that, under circumstances that would normally give rise to reportable ICDs, AFAPs do not appear to impair their objectivity and independence by affording management discretion not to disclose ICDs.

Controlling for Self-Selection Bias

Our analysis thus far assumes that a firm's choice of AFAPs on the audit committee is exogenous. However, it is possible that before agreeing to serve on the audit committee, AFAPs, by virtue of their existing knowledge about the firm's accounting systems, systematically opt out of serving on audit committees of firms with weak internal controls to protect their reputation, avoid litigation, or avoid the additional workload. This suggests that ICFR effectiveness and the presence of AFAPs on the audit committee are endogenous. From an econometric perspective, the presence of any self-selection would introduce a bias in our regression analysis (Maddala 1983). To address the endogeneity issue, we re-estimate Equation (1) in a system of simultaneous equations that includes Equation (1) and a self-selection Probit regression that models *AFFPART* on *ICPROB* along with variables representing other firm characteristics. We draw on Agrawal and Chadha (2005) to identify variables that are likely to influence the presence of AFAPs on the audit committee.

The simultaneous regression analysis is performed by first regressing each endogenous variable on all exogenous variables (instruments). In the second stage, Equation (1) and the self-selection equation are estimated separately, with the right-side endogenous variable replaced by its fitted value from the first stage regression. Results for the self-selection equation from the second stage (not tabulated) indicate that the coefficient on the fitted value of *ICPROB* is positive and not significant ($p = 0.326$). This finding suggests that the

TABLE 8
Logistic Regression Results for Alternative Explanation Tests

Variable	Expected Sign	Test 1	Test 2
Intercept	?	−2.642 _0.001_***	−3.353 _0.032_**
AFFPART	?	−1.707 _0.050_**	−1.864 _0.039_**
NONAFFPART	−	−1.576 _0.018_**	−0.875 _0.053_*
SPECACCTG	−	−0.184 _0.258_	0.115 _0.361_
POTACCTG	−	0.324 _0.080_*	0.213 _0.212_
FINANCE	−	−0.062 _0.394_	0.201 _0.223_
SUPER	−	0.412 _0.158_	0.940 _0.045_**
LIKELYICD	+	1.347 _0.018_**	
AFFPART × *LIKELYICD*	?	1.015 _0.405_	
NONAFFPART × *LIKELYICD*	?	1.032 _0.234_	
SPECACCTG × *LIKELYICD*	?	0.850 _0.056_*	
POTACCTG × *LIKELYICD*	?	−0.467 _0.199_	
FINANCE × *LIKELYICD*	?	−0.085 _0.819_	
SUPER × *LIKELYICD*	?	0.086 _0.885_	
HIGHDA	+		1.435 _0.021_**
AFFPART × *HIGHDA*	?		1.292 _0.292_
NONAFFPART × *HIGHDA*	?		0.421 _0.547_
SPECACCTG × *HIGHDA*	?		0.115 _0.796_
POTACCTG × *HIGHDA*	?		−0.382 _0.300_
FINANCE × *HIGHDA*	?		−0.588 _0.116_
SUPER × *HIGHDA*	?		−0.661 _0.321_
Other Control Variables		None	included
Observations		1,225	1,225
Pseudo R^2/χ^2		0.13/101.38***	0.18/123.21***

(*continued on next page*)

TABLE 8 (continued)

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

The first row in each cell reports the coefficient estimate and the second row reports the p-value (in italics) where p-values are one-tailed for variables with an expected sign, and two-tailed otherwise.

LIKELYICD = 1 for firms with a predicted probability of an internal control deficiency (*PREDICD*) that places them in the top 20 percent, and 0 otherwise, where *PREDICD* is computed using the parameter estimates from the estimation of Equation (1) without the test and financial expertise variables; and *HIGHDA* = 1 for firms with performance-adjusted discretionary accruals (*PADJDA*) that places them in the top 20 percent, and 0 otherwise.

See Table 2 for remaining variable definitions.

association between AFAPS and ICDs is not endogenous, insofar as AFAPs do not appear to opt out of accepting directorships on firms with ICDs. The corresponding results for Equation (1) indicate that the parameter estimate for the fitted value of *AFFPART* remains negative and significant ($p = 0.037$). Hence, our findings are robust to possible self-selection of AFAPs. We find similar results for the self-selection analyses of UFAPs.

We also examine the frequency of AFAPs for firms with *LIKELYICD* = 1 (firms with a predicted probability of an ICD that places them in the top 20 percent) versus *LIKELYICD* = 0 (remaining firms). The descriptive statistics indicate that about 6.67 percent of firms with *LIKELYICD* = 1 have an AFAP on their audit committee, while the corresponding representation for firms with *LIKELYICD* = 0 equals 5.82 percent. A difference test indicates that the difference in frequencies is not statistically significant ($p = 0.309$). Hence, consistent with the results from the simultaneous regression analysis, it seems less plausible that AFAPs are avoiding audit committee membership for firms with a high risk of ICDs.[16]

AFAPs and Financial Reporting Quality

Given that the audit committee is responsible for overseeing the quality of financial reporting, and internal controls influence the quality of financial reporting, we also investigate the association between FAPs on the audit committee and the quality of financial reporting. Our findings and conclusions will achieve greater validity if the results from the financial reporting quality analyses are consistent with the internal control results.

Consistent with the prior literature (e.g., Menon and Williams 2004; Geiger and North 2006), our proxy for the quality of financial reporting is performance-adjusted discretionary accruals (*PADJDA*). We estimate *PADJDA* following Kothari et al. (2005). To test the association between *PADJDA* and AFAPs, we regress *PADJDA* on our two test variables, four expertise variables, and other firm and governance variables previously found to be related to discretionary accruals (Ashbaugh et al. 2003; Menon and Williams 2004; Cahan and Zhang 2006; Geiger and North 2006). The results from this analysis (not tabulated) indicate that *AFFPART* is negatively associated with *PADJDA* ($p = 0.032$). This suggests that AFAPs on the audit committee exercise objectivity and independence by restricting managerial discretion over earnings management, and is consistent with AFAPs associated with better quality financial reporting. The coefficient on *NONAFFPART* is not significant ($p = 0.105$). We also find a statistically significant difference between the coefficients *AFFPART* and *NONAFFPART* ($F = 8.35$; $p = 0.004$). Our results here suggest that the intimate knowledge AFAPs have about the firm affords them more effective monitoring of financial reporting than UFAPs.

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[16] The frequency of UFAPs for firms with *LIKELYICD* = 1 (15.42 percent) is significantly ($p = 0.06$) higher than firms with *LIKELYICD* = 0 (11.12 percent). This finding is inconsistent with the notion that UFAPs opt out of serving in firms with ICDs.

We also evaluate whether firms with high *PADJDA* are less likely to have disclosed ICDs when they have an AFAP on their audit committee. We evaluate this by replicating our analysis in the third column of Table 8 after employing a different method to identify the firms vulnerable to ICDs. Vulnerable firms are those with *PADJDA* that places them in the top 20 percent (most aggressive) across our sample. Consistent with our earlier findings, the results reported in the last column of Table 8 indicate that AFAPs do not permit any more discretion on internal control reporting when confronted with a highly aggressive financial reporting environment. Our results remain unchanged when we employ a 10 and 30 percent threshold for identifying firms with aggressive discretionary accruals.

VI. CONCLUSION

The practice of "revolving-door" appointments has attracted considerable regulatory attention in recent years because regulators believe such appointments threaten the objectivity and independence of the oversight of the financial reporting process. We examine how internal control over financial reporting quality is affected by the presence of former partners on the audit committee who are affiliated (AFAPs) and unaffiliated (UFAPs) with the firm's external auditor. Our results indicate that AFAPs and UFAPs are negatively associated with the incidence of internal control deficiencies (ICDs). We also find that AFAPs appointed to the audit committee within and after the three-year "cooling-off" period are negatively associated with ICDs. Our results are robust to a number of sensitivity and additional tests. Two critical additional tests provide evidence suggesting that AFAPs do not appear to assist management efforts to circumvent reporting ICDs under conditions that would normally give rise to ICDs, and AFAPs are negatively associated with performance-adjusted discretionary accruals.

The results of our study suggest that the expertise possessed by former partners can offer significant contribution to the monitoring of internal controls, and that the independence concerns raised by policymakers and regulators may not be warranted in the instance of AFAPs on the audit committee. Given that the current rules adopted by the NYSE and NASDAQ enforce a three-year "cooling-off" period before firms can appoint AFAPs as directors, our results could be of relevance to regulators in future revisions of either their independence criteria or type of firm officers who are required to satisfy such criteria.

One caveat to our findings is that, like prior research on ICDs, we are unable to observe whether firms actually had a reportable ICD but elected not to disclose it with the aid of their auditor and/or audit committee. We address this potential alternative explanation by performing several supplementary tests to show that independence threats are unlikely to explain our results.

Second, due to the lack of data, we are unable to test whether FAPs who actually worked on the audit of a client are as effective as FAPs who have not worked on the audit of the client. This is an inherent limitation of research on FAPs. A further limitation of studies of this nature is that we test associations; we do not provide evidence of causation. Finally, because historical employment data is typically not available for non-partner audit firm employees, we are unable to consider how our findings are affected by audit committee members with non-partner-level experience with a firm's current or former auditor. Given that partners generally have longer tenure in the audit firm and thus closer associations with clients, we contend that potential threats to the integrity of the audit committee's oversight responsibilities are more prominent for partner-level "revolving-door" appointments than for non-partner-level "revolving-door" appointments to the audit committee. Our contentions could be examined in future research when more complete data on the background of directors on the audit committee become available.

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Employee Discretion and Performance Pay

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ABSTRACT: This study examines the relationship between performance pay and the decision to delegate the choice of work methods and scheduling. I compare two theoretical approaches, based on specific knowledge and measurement costs, respectively. Both perspectives suggest a complementarity between discretion and performance pay, but the former predicts a positive effect of job complexity on discretion and performance pay, and the latter implies a negative effect. Results suggest that group and firm-wide incentives are used to decentralize decisions and to take advantage of employees' specific knowledge, whereas piece rates are driven by performance measurement considerations and are not associated with more discretion.

Keywords: *discretion; delegation; performance pay; piece rate; specific knowledge.*

Data Availability: *The European Working Conditions Surveys are publicly available from the European Foundation for the Improvement of Living and Working Conditions (http://www.eurofound.europa.eu).*

I. INTRODUCTION

This study provides empirical evidence on employee discretion (autonomy) and performance pay contracts for a large sample of European employees. I examine whether a firm's decision to delegate the choice of work methods and scheduling (i.e., to give more discretion) is related to incentive pay. The idea that decentralization must be combined with appropriate incentive schemes has been studied extensively by theorists (Stiglitz 1975; Mirrlees 1976; Melumad and Reichelstein 1987; Prendergast 1995; Baiman and Rajan 1995; Aghion and Tirole 1997; Baldenius 2003). However, despite recent efforts (Osterman 1994b; MacLeod and Parent 1999; Nagar 2002; Abernethy et al. 2004; Foss and Laursen 2005; Moers 2006), empirical research is still small compared to the wealth of theoretical work in the area. There is a large empirical literature on performance pay that

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does not consider discretion as part of the analysis, and a smaller empirical research that touches on discretion but rarely examines its relationship to performance pay.[1]

Early research on incentive contracts placed a special emphasis on the informativeness of performance measures (Holmström 1979) and inspired an empirical literature focused on examining whether the volatility of stock returns, firm earnings, or other financial or nonfinancial performance measures influenced the use of incentive contracts (Lambert and Larcker 1987; Jensen and Murphy 1990; Garen 1994; Aggarwal and Samwick 1999). Prendergast (2002) pointed out that such evidence is inconsistent with theory—many studies actually find a positive or insignificant relationship between risk and incentive pay. He argued that in riskier environments, jobs are more complex, employees have more specific knowledge, and firms tend to give more discretion. With more discretion, firms must also give more performance pay to make sure that incentives are aligned, which would explain the positive correlation between risk and incentives. Earlier research also underlined the importance of job differences to understand observed patterns of performance pay and discretion: Lazear (1986) argued that firms weigh monitoring costs against output measurement costs in choosing between salaries and piece rates; Holmström and Milgrom (1991), Feltham and Xie (1994), and Baker (2002) examined the role of multi-tasking on incentive contracts; and several studies have shown how discretion and incentive pay are most effective for jobs where employees have an informational advantage (Lazear 1986; Melumad and Reichelstein 1987; Baker 1992). Yet, the empirical literature does not speak to the question of how differences across jobs influence performance pay and discretion.

The current approach has two distinguishing features. First, it hypothesizes that job complexity is an important source of variation for discretion and performance pay and tests whether evidence conforms with such theoretical predictions. It therefore departs from previous empirical research in which the volatility of the business environment has been taken as the main source of variation.[2] Second, it provides evidence about four different types of incentive contracts (piece rates, group performance pay, profit sharing, and stock ownership), and relates them to the employees' levels of discretion—i.e., it examines whether the allocation of discretion has different effects on different types of performance pay. In this manner the current study complements Nagar (2002), where the issue of how firms choose between different types of contracts does not arise because all performance pay contracts in his data are based on the same performance measure.

The data are drawn from the three latest European Working Conditions Surveys (EWCS), which were conducted in 1995–96, 2000–01, and 2005 by the European Foundation for the Improvement of Living and Working Conditions, a European Union government agency. These surveys provide a detailed description of working conditions, including discretion levels and performance pay contracts, and offer two important advantages over other data sets: they provide information on discretion and pay method across a wide variety of jobs, and they include information on four different types of performance-related pay.

I test two competing theoretical views. The first one emphasizes specific knowledge and predicts that complexity will be positively associated with discretion and performance pay: employees with more complex jobs have more specific knowledge, firms will give discretion to ensure that this knowledge is used, and performance pay contracts will be needed to align incentives. The second view puts the emphasis on measurement costs and suggests the opposite relationship: when jobs are more complex, performance is more difficult to measure, performance pay will not be optimal, and discretion will be limited. Thus, both views suggest a complementarity between discretion and performance pay, but they have opposite predictions on the effect of job complexity.

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[1] For the empirical literature on performance pay, see the survey by Murphy (1999) and later work by Lazear (2000), Shearer (2004), and Bandiera et al. (2005). For empirical evidence on discretion, see Appelbaum et al. (2000), Golden (2001) and Zoghi et al. (2005).

[2] See Nagar (2002) and the abovementioned empirical literature on performance pay.

In general, the analysis provides more support for the former view than for the latter. Job complexity has a positive effect on discretion and on all incentive schemes except piece rates, which suggests that, as complexity increases, the benefits from a better use of specific information outweigh the costs caused by a more imperfect measurement of performance. Measurement costs are important for piece rates, but covariation between discretion and piece rates is negative, which is inconsistent with the idea of complementarity. This suggests that, unlike other incentive schemes, piece rates are mostly influenced by performance measurement considerations, and are not meant to serve as a mechanism to delegate decision-making.

II. THEORY

This section explains the idea that employee discretion and performance pay are complementary organizational choices, i.e., discretion raises the marginal benefit of performance pay, and performance pay raises the marginal benefit of discretion.

One can think of employment as an agency relationship in which the employee's actions are not perfectly observed by the employer (the principal), and the two parties have different objectives. If the employer offers more performance pay, then the agent's incentives will be better aligned with the principal's, and the marginal benefit of monitoring will fall (monitoring will be less useful)—i.e., the marginal benefit of discretion will increase. Conversely, if the principal gives more discretion to the employee, then the marginal benefit of performance pay will increase, because it will be more important to align the employee's interests with the principal's. This complementarity implies that two systems may be optimal for different sets of parameters: one with low levels of discretion and performance pay, and an alternative with high levels of both variables.[3] The former has been called a "salary system" and the latter a performance pay or piece rate system (Lazear 1986). In a salary system, the employee does not work hard unless he is closely supervised. Supervision enables the employer to fire the employee if he is not behaving in accordance with the firm's objectives. Therefore, an employee who works for salary will generally have less discretion, while someone who receives performance pay will be less supervised and will have more discretion.

To illustrate this trade-off, suppose x is the outcome of interest to the principal, a is labor input, and $c(a) = a^2/2$ is the agent's disutility of effort. Assume that principal and agent are risk-neutral, and earn $x - w$ and w, respectively, where w is the agent's remuneration. Suppose y is a performance measure chosen by the principal to reward the agent, such that $w = w(y)$. The performance measure can be equal to x (output monitoring), to a (input monitoring), or to some third measure correlated with x or a. Since the principal will prefer the most informative measure, there are cases where $y = a$ will be optimal and cases where $y = x$ will be preferred.

For example, suppose that $x = a + t$, where t is exogenous noise and is not observed by the principal or the agent. If labor input can be measured at very low cost (compared to the cost of measuring x), then it is better to have $y = a$ instead of $y = x$. The firm can ask the agent to choose the optimal level of input ($a = 1$) and fire him otherwise. Thus, the agent will have no discretion and will be paid a salary. Of course, if the cost of input measurement is high compared to the cost of output measurement, then the firm would prefer to measure x instead of a, and would offer a performance pay contract. Since a would not be measured, the employee would have discretion—i.e., he would choose a to satisfy a standard incentive compatibility constraint. Thus, depending on how costly it is to measure x and a, a salary system or a performance pay system will be optimal.

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[3] See Roberts (2004) for an overview of complementarities in organizational design.

Now suppose that $x = at$, where in this case t is known to the agent, but not to the principal. We can think of t as "specific knowledge" that the employee learns on the job and is too costly for the principal to learn. Since the optimal level of input is now given by $a = t$,[4] being able to measure the input is not enough to control the agent: even if the principal knew what a has been chosen, he would still have to know t to discern whether the choice was optimal. As a consequence, if t cannot be learned, then a salary system will not be optimal. An alternative is to ask the agent to maximize x—i.e., to "sell the firm" to the agent or give him some "high-powered" incentive scheme. This makes sense as long as the agent has discretion to choose a; if not, he will not use his information about t to choose $a = t$. Thus, in this case, the employer is likely to prefer to monitor the output ($y = x$) and delegate discretion to the agent.

The literature on specific knowledge (Baker 1992; Prendergast 2002; Raith 2008) holds that employees with more complex jobs have more specific knowledge. For this reason, in Prendergast (2002), when the job is complex, it is too costly for the firm to know which actions are optimal, and it is better to use a performance pay scheme and let the agent decide which action to take. Because the employee has discretion and is paid through a performance pay contract, he will use his specific knowledge to meet organizational goals. In Raith (2008), the job involves multiple tasks and the agent can have private information about the optimal distribution of effort across tasks. In this setting, when jobs are more complex, there will be more discretion and performance pay in order to take advantage of the employee's specific knowledge. In addition, in a two-agent variant of the model, Raith (2008) shows that complexity will reduce individual-based performance pay and will increase group-based performance pay if the employee's specific knowledge is about the value of his contribution to team output.

Job complexity is also important in the measurement cost approach. In Lazear (1986), to implement a piece rate, the firm must be able to measure actual output, but to implement a salary scheme it suffices to know whether input is above or below a minimum required level. If complexity means that it is very costly to measure output, when jobs are complex firms will prefer a salary system, and employees will have less discretion. Thus, complexity is likely to have a negative effect on both discretion and performance pay. In Holmström and Milgrom (1991), jobs are complex for a different reason: there are multiple tasks and differences in measurement costs across tasks. Performance pay contracts generate distortions because employees will tend to concentrate their effort on the tasks that have more impact on pay,[5] and if so, firms can prefer to pay a straight salary. Related work on congruity (Feltham and Xie 1994; Baker 2002) also suggests that lack of congruity will be a more important problem when jobs are more complex. Since lack of congruity leads to distortions in effort, it can be optimal to pay a straight salary.[6]

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[4] Total value is given by $x - c(a)$. If $x = at$ and t is known and can be contracted on, then a can be chosen so as to maximize the exact total value $x - c(a) = at - a^2/2$. Maximizing with respect to a yields $a = t$.

[5] Because output measurement costs vary across tasks, in general the (second-best) optimal performance pay contract will be such that the weights of the different output measures in the agent's remuneration will not be proportional to their relative importance in the principal's objective function.

In summary, both the specific knowledge and measurement cost approaches imply that an increase in complexity will produce a positive covariation between discretion and performance pay. However, the specific knowledge approach suggests that discretion and performance pay will increase, while the measurement cost approach suggests they will diminish.

III. EMPIRICAL EVIDENCE

Empirical evidence can be organized in three groups. The first concerns the determinants of discretion and performance pay (Osterman 1994b; MacLeod and Parent 1999; Nagar 2002; Foss and Laursen 2005).[7] MacLeod and Parent (1999) use individual data to estimate the determinants of pay method. In some specifications, they find that discretion reduces the use of piece rates and hourly wages versus other pay methods, raising the probability that the firm chooses piece rates over hourly wages, and commissions over salaries. The current study is different because it focuses on job complexity and allows for the possibility that employees receive more than one type of pay.[8] Osterman (1994b) estimates the effect of pay level, performance pay, and other human resource (HR) practices on discretion for a sample of establishments, but finds no significant effect of performance pay. Nagar (2002) and Foss and Laursen (2005) study uncertainty as a source of variation for discretion and performance pay. They use a simultaneous equation approach in which discretion and pay method are endogenous and the level of uncertainty can influence the two choice variables. Both studies find a positive effect of discretion on performance pay and some evidence of a positive effect of uncertainty on discretion and performance pay. However, there is no evidence of a positive effect of performance pay on discretion. The current study is different because I use a reduced-form estimation approach in which job complexity (instead of uncertainty) is the main source of contract variation.

A second set of studies estimates the effect of bundles of HR practices on labor productivity, output quality, and financial performance, typically using firm or establishment data. This literature finds that the joint introduction of performance pay, employee involvement policies, and other "innovative" HR practices increases labor productivity and output quality, which is consistent with complementarity.[9] My study differs from this literature in two respects. First, I am concerned about the reasons *why* firms give discretion and performance pay. As noted in the previous section, the positive effect of discretion and incentive contracts on performance is consistent with several theories, and the aim of this study is to test these theories empirically. Second, I am interested in discretion as an aspect of job design. The studies of bundles typically consider two types of employee involvement practices: some that imply job re-design and others that can be adopted without major changes in job design.[10] I focus only on the former.

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[6] Note that here, as in Lazear (1986), measurement costs play a key role: in fact, consider the multi-task setting, and suppose a job becomes more complex because extra tasks are added to it. If measurement costs were similar for new and old tasks, then the increase in complexity could have no effect on performance pay and discretion.

[7] See also Abernethy et al. (2004) and Moers (2006). Abernethy et al. (2004) relate decentralization to the use of divisional summary performance measures (DSMs) versus more specific (nonfinancial) or broader (financial) measures. They study whether divisional managers have more discretion when DSMs weigh more heavily in their evaluation. However, the article does not tell whether DSMs are used as part of an explicit incentive contract. Moers (2006) uses a sample of managers with a performance pay contract and examines the influence of measurement quality on delegation. Quality is given by the verifiability, sensitivity, and precision of performance measures. He shows that firms delegate more when the difference in quality between financial and nonfinancial measures of performance increases.

[8] According to the EWCS, in 2005 approximately 17 percent of salary earners received some kind of performance pay, and 22 percent of employees with performance pay had at least two different types of incentive scheme.

[9] See Ichniowski (1990), Cooke (1994), MacDuffie (1995), Huselid (1995), Huselid and Becker (1996), Delery and Doty (1996), Ichniowski et al. (1997), Appelbaum et al. (2000), Cappelli and Neumark (2001), Black and Lynch (2001), Conyon and Freeman (2004), and Kruse et al. (2004). The effects on financial performance are less clear. In particular, it has been noted that adjustment costs are important and that high-involvement practices tend to raise labor costs Cappelli and Neumark (2001).

The third and last group of studies analyze performance pay or discretion, but not their relationship to one another. Research on performance pay shows a very large productivity effect, which is consistent with the above-mentioned literature on HR bundles. As for discretion, research is primarily concerned with work-family balance, the relationship with other HR practices, and the effects on employee well-being and motivation.[11]

IV. DATA

The main data sources for this article are the second, third, and fourth European Working Conditions Surveys (EWCS), conducted in 1995–96, 2000–01 and 2005, respectively, by the European Foundation for the Improvement of Living and Working Conditions, a European Union government agency.[12] The main purpose of the surveys was to evaluate the quality of working conditions in Europe. Aside from standard employer and employee characteristics, they include questions in five different areas: the physical work environment, time use, job characteristics, the social environment at work, and health outcomes.

The EWCS has already been used to study a variety of topics. Green and McIntosh (2001) used the first and second Surveys to analyze the evolution of work effort in Europe from 1991 to 1996, and Nienhüser and Matiaske (2006) used the third Survey to analyze the working conditions of temporary agency workers. Daniels et al. (2007) studied the relationship between discretion (job control) and health outcomes. Tangian (2007) conducted a statistical analysis of the third Survey to construct an indicator of working conditions and studies its correlation with earnings across Europe, and Morley (2007) used the fourth Survey to analyze the consequences of the European Union enlargement.

The EWCS is based on individual interviews conducted at the respondents' homes. The second Survey (Paoli 1997) was conducted between November 1995 and January 1996 in the 15 countries that were members of the European Union (EU)—the so-called EU-15 group. It has an important limitation for this study, because it provides information about only one type of performance pay (piece rates). For this reason, and for the sake of brevity, I do not tabulate the results from this Survey, although I discuss them in the text. The third and fourth Surveys provide more complete information and constitute the main basis for the analysis. The third EWCS surveyed the EU-15 group in March 2000 (Paoli and Merllié

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[10] For example, corporate newsletters, union-management meetings and offline consultation schemes can be implemented with little job re-design, whereas self-managed online teams involve more substantial changes.

[11] The effects of explicit incentive contracts on productivity have been studied by Lazear (2000), Shearer (2004), Bandiera et al. (2005), and Matsumura and Shin (2006) among others. Studies of determinants of discretion include Osterman (1995), Golden (2001), and Zoghi et al. (2005). For the effect of discretion on satisfaction, see Karasek (1979), Parker and Wall (1998), Singh (2000), and Parker (2003).

[12] I do not use the first EWCS (conducted in 1991) because it does not have information about job complexity, age, tenure, the number of subordinates, sex, and industry. Moreover, the questionnaire does not distinguish between different types of performance pay (the only question on pay method is: "Do your wages or income depend upon your work rate?"), and there are only two questions about discretion (order of tasks and speed of work).

2001) and 12 "acceding" and "candidate" countries[13] in May and July 2001 (Paoli and Parent-Thirion 2003). The fourth EWCS was conducted between September and November 2005 in those 27 countries, and in Croatia, Norway, Switzerland, and Turkey (Parent-Thirion et al. 2007). The response rates were 61 percent in the second and third Surveys and 48 percent in the fourth Survey. Because I only use data about employees, my sample has almost 24,000 observations from 2000–01, nearly 20,000 observations from 2005, and more than 41,000 pooled observations (2000–05). I also discuss results based on the second Survey, which includes almost 10,000 usable observations.

V. MODEL SPECIFICATION AND DEFINITION OF VARIABLES

I investigate the following two relations:

$$\text{Discretion} = f(\text{Complexity, Controls}); \tag{1}$$

$$\text{PerformancePay} = g(\text{Complexity, Controls}). \tag{2}$$

The measures of employee discretion, performance pay, and job complexity, as well as the control variables, are discussed next.

Employee Discretion

Employee discretion or "job autonomy" is defined in the organizational behavior literature as the extent to which employees can choose their own work methods and schedules (Hackman and Oldham 1975). The EWCS contains six related questions: two about the choice of work methods and work hours, and four more specific questions that concern discretion to choose the order of tasks, the rate or speed of work, when to take breaks, and when to take vacations and days off (see definitions in Table 1). Based on these questions, I define six dichotomous variables: *METHODS*, *HOURS*, *ORDER*, *SPEED*, *BREAKS*, and *DAYSOFF* (see Table 2 for summary statistics). Factor analysis of these variables yields two measures of discretion (see the Appendix for details). The first one measures discretion to choose the methods of work and is defined as $DIMETH = (ORDER + METHODS + SPEED)/3$, and the second one measures discretion to choose work schedules and is defined as $DISCHED = (BREAKS + HOURS + DAYSOFF)/3$. As in Nagar (2002), the six base variables are standardized to have a 0 mean and a standard deviation equal to 1.

Performance Pay

The third and fourth Surveys contain information about four types of performance pay: piece rates or productivity payments, group performance pay, profit sharing, and employee stock ownership. The second Survey only includes information about piece rates or productivity payments. In each case, the employee reports whether his compensation includes each of these items, and based on the answers I construct four dichotomous variables: *PRATE* (piece rate or productivity payments), *GPAY* (group performance pay), *PSHARING* (profit sharing), and *STOCK* (stock ownership). Variable definitions are shown in Table 1, with summary statistics in Table 2. Piece rates are the most frequent type of performance pay (around 11 percent in 2005), followed by profit-sharing schemes (around 8 percent)

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[13] EU-15 group: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, The Netherlands, Portugal, Spain, Sweden, and United Kingdom. "Acceding" and "candidate" countries: Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lituania, Malta, Poland, Romania, Slovakia, and Slovenia.

TABLE 1
Definitions of Variables

Name	Question/Definition
ORDER	Are you able to choose or change your order of tasks?
METHODS	— your methods of work?
SPEED	— your speed or rate of work?
BREAKS	Can you take your break when you wish?
HOURS	Are you able to influence your work hours?
DAYSOFF	Are you free to decide when to take holidays and days off?
PRATE	Does your remuneration include piece rate or productivity payments?
GPAY	— payments based on the overall performance of a group?
PSHARING	— payments based on the overall performance of the company (profit sharing scheme) where you work?
STOCK	— income from shares in the company you work for?
COMPLEX	Generally, does your main paid job involve complex tasks?
REPET	— short repetitive tasks of less than 10 min?
MONOT	— monotonous tasks?
(N)SUBORD	How many people work under your supervision, for whom pay increases, bonuses or promotion depend directly on you?
ESIZE	How many people in total work in the unit of the establishment where you work?
FTENURE	How many years have you been in your company or organization? (If less than 1 year) How many months?
JTENURE	How many years have you been in your present main job? (If less than 1 year) How many months?
AGE	Years of age
FEMALE	Sex
EDULEVEL	One-digit ISCED code
OCCUPATION	One-digit ISCO-88 occupation
INDUSTRY	One-digit NACE industry
COUNTRY	Country of interview

Scales: *NSUBORD*, *FTENURE*, *JTENURE*, and *AGE* are continuous. *SUBORD*: 0 = no one, 1 = 1–4 people, 2 = 5–9 people, 3 = 10 or more people. *ESIZE*: 0 = 1 (interviewee works alone), 1 = 2–4 people, 2 = 5–9, 3 = 10–49, 4 = 50–99, 5 = 100–249, 6 = 250–499, 7 = 500 or more people. For all other variables the scale is 0 = no, 1 = yes.

and group-performance pay (around 5 percent), whereas stock ownership is very rare, even though it has greatly increased since 2000.

Piece rates diminished from 1995–96 to 2000–01 and increased from 2000–01 to 2005 (see Table 2). Performance pay in general also increased from 2000–01 to 2005. This trend is not due to changes in the international composition of the sample: I have also computed performance pay means for the same group of countries that were surveyed in 1995–96, and the percentage of employees with piece rates falls from 1995–96 to 2000–01, but all performance pay variables increase from 2000–01 to 2005. The percentage of employees with at least one type of performance pay raises from 11.6 (in 2000–01) to 17.8 percent (in 2005). The increase in performance pay is consistent with evidence about the intensification of work in Europe (Green and McIntosh 2001).

TABLE 2
Descriptive Statistics

	2000–01 (n = 23,958)		2005 (n = 19,911)		Pooled 2000–05 (n = 41,425)	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
ORDER	0.622	0.485	0.637	0.481	0.627	0.484
METHODS	0.652	0.476	0.665	0.472	0.653	0.476
SPEED	0.689	0.463	0.698	0.459	0.692	0.462
BREAKS	0.550	0.497	0.493	0.396	0.525	0.458
HOURS	0.342	0.474	0.211	0.328	0.283	0.423
DAYSOFF	0.503	0.500	0.528	0.387	0.515	0.455
DIMETH	−0.061	0.843	−0.057	0.830	−0.066	0.841
DESCHED	−0.116	0.719	−0.154	0.700	−0.127	0.720
PRATE	0.102	0.303	0.111	0.315	0.110	0.312
GPAY	0.024	0.154	0.049	0.216	0.035	0.183
PSHARING	0.057	0.232	0.084	0.278	0.070	0.255
STOCK	0.009	0.097	0.019	0.138	0.013	0.115
PERFPAY	0.162	0.369	0.202	0.401	0.183	0.386
COMPLEX	0.555	0.497	0.625	0.484	0.580	0.494
REPET	0.450	0.498	0.439	0.496	0.448	0.497
MONOT	0.406	0.491	0.426	0.494	0.416	0.493
SUBORD	0.291	0.758	0.301	0.780	0.290	0.762
NSUBORD			2.578	23.999		
ESIZE	3.383	1.843	3.408	1.781	3.404	1.823
EDULEVEL			3.430	1.244		
FTENURE	9.504	9.271	9.515	9.476	9.497	9.359
JTENURE	9.942	9.503				
AGE	38.286	11.064	40.257	11.382	39.140	11.211
FEMALE	0.488	0.500	0.530	0.499	0.509	0.500

The percentages of performance pay are low as compared to other data sources, likely for three reasons. First, most research relies on establishment-level surveys, in which a positive answer to the performance pay question means that some (not necessarily all) employees receive performance pay.[14] Therefore a dichotomous variable based on that question will give an *upper* bound of the exact percentage of employees with performance pay. Second, in those studies the respondent is usually an HR manager, and the questionnaires' focus is on performance and HR strategies, whereas the EWCS is answered by employees and its main focus is on working conditions. Third, most studies are restricted to a single job, industry, or firm.[15] In those cases, data are not representative and response bias is a natural concern—companies that are more active or interested in implementing "high-performance" practices are more likely to welcome academic researchers. When EWCS data are compared with data from similar surveys, the percentage of employees with performance pay is actually quite similar.[16]

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[14] See Osterman (1994a, 1994b), Cappelli and Neumark (2001), Black and Lynch (2001, 2004), and Conyon and Freeman (2004) among others. In some cases the question is asked for a few broad categories of employees (e.g., managerial versus non-managerial, core versus non-core), as in MacDuffie (1995).

[15] See Delery and Doty (1996), Ichniowski et al. (1997), Lazear (2000), Shearer (2004), Bandiera et al. (2005), and Matsumura and Shin (2006).

EWCS data on performance pay are consistent with evidence about performance measurement. The Survey provides indirect information about three types of performance measurement: specifically, it asks whether "the pace of work is dependent on numerical production targets," and whether the job involves "meeting precise quality standards" and "assessing yourself the quality of your own work." A positive answer to the first question means that the firm sets production targets and the employee is working to meet them, which suggests that the employee must be monitored on output. Consistent with this implication, piece rates are much more correlated with numerical production targets than with precise quality standards or self-assessment.[17]

Job Complexity

I examine three measures of complexity. *COMPLEX* is equal to 1 when the respondent's job involves doing complex tasks, and 0 otherwise (see Table 1). The other two variables are also dichotomous and measure whether the job involves monotonous tasks (*MONOT*) or "short repetitive tasks of less than ten minutes" (*REPET*). As expected, *COMPLEX* is negatively correlated with *REPET* and *MONOT*, although the correlations are relatively small compared to the correlation between *REPET* and *MONOT* (see Table 5).[18] This may be because *REPET* and *MONOT* are not only informative within low-skill occupations, but also because task variety is only one source of complexity among others. For these reasons, *a priori COMPLEX* seems a better measure of complexity than *REPET* or *MONOT*.

Since these measures are self-reported, there may be various sources of bias. One possibility is that employees alter their responses to influence employers. This bias seems unlikely, however, because the EWCS was not conducted or sponsored by employers, and employees were interviewed at home and did not report their employer's name. A second source of potential bias is that respondents' perceptions of complexity may vary with skills and experience. However, I find that job tenure, firm tenure, and age are positively correlated with *COMPLEX* and negatively correlated with *REPET* and *MONOT*, which would be inconsistent with the idea that inexperienced workers over-estimate complexity. I also regress the three complexity variables on firm tenure, age, age squared, and standard controls (the number of subordinates, establishment size, gender, and occupation, industry, and country indicators), using the pooled 2000–05 sample (results available upon request). I find that firm tenure and age have a positive effect on *COMPLEX* and a negative effect on *MONOT*. Age has a negative effect on *REPET*, but the effect of firm tenure is positive.[19]

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[16] The EWCS rates of performance pay are similar to the rates computed from other individual-level data sets, such as the German Wage Structure Samples (Jirjahn 2002) or the French Salary Structure Survey (Fakhfakh and Pérotin 2002; Pouget 2005). The British Household Panel Survey (BHPS) does show a higher percentage of employees with performance pay than the EWCS, but the phrasing of the questions is different: whereas the EWCS asks whether the respondent receives performance pay, the BHPS asks whether employees have *ever* received performance pay. For the United States individual-level data sets also find performance pay contracts to be less frequent than suggested by establishment-level surveys (Parent 1999; Heywood and O'Halloran 2005). For example, using the latest National Longitudinal Survey of Youth (NLSY) available data on performance pay (1995–2000), Heywood and O'Halloran (2005) report that 8.44 percent of male full-time private-sector employees earned piece rates, tips, or commissions, and 19.42 percent of them earned bonuses based on objective or subjective performance assessments.

[17] Piece rates are also much more correlated with quality standards (which imply that there is some objective measure of output quality) than with self-assessment.

[18] However, Cronbach's alpha between *REPET* and *MONOT* (0.392 in the pooled sample) is not high enough to recommend aggregation.

Control Variables

Some control variables are available for the three Surveys, while others are only available for the third or fourth Surveys.

As reported in Tables 1 and 2, the variables available for the three surveys are the number of subordinates, tenure in the firm, age, gender, establishment size, industry, occupation, and country. The number of subordinates is the number of people whose pay and promotion depend directly upon the respondent (see Table 1). Responses are available in four intervals, from which I create four indicator variables and a summary measure (*SUBORD*). Information about establishment size also comes in intervals, and I also create a summary measure (*ESIZE*) and an indicator for each interval (see Tables 1 and 2 for more detailed information about *ESIZE*). Data on industry and occupation are provided at the one-digit level and are based on standard international classifications (see Table 1).

In the third Survey there is a question about tenure in the job, but this question is not included in the fourth Survey. Thus, for the 2000–01 regressions, I use three measures of tenure as controls: firm tenure, job tenure, and an interaction term (firm tenure × job tenure). On the other hand, the fourth Survey provides information about completed education, with a scale based on one-digit ISCED codes. With this information I create an indicator for each level of educational attainment and one summary measure (*EDULEVEL*) (see Tables 1 and 2). In addition, the fourth Survey provides the exact number of subordinates, from which I construct a continuous variable (*NSUBORD*). I use *NSUBORD* and its square as control variables in the regressions with 2005 data.

VI. RESULTS

Table 3 reports the means of the dependent variables by occupation. Discretion is highest for the top occupations and tends to diminish with occupational level. The only clear exception is for professionals, for whom *DESCHED* is relatively low and *DIMETH* is relatively high. There are also important differences in performance pay across occupations. Piece rates are most common among skilled agricultural workers, craft and related trades workers, and machine operators and assemblers (15 to 23 percent of employees), and least common for clerical and other service jobs (less than 8 percent). In contrast, the other types of performance pay are more common for white-collar employees in general and managers in particular than for blue-collar workers.

To estimate the size of the variation in discretion and performance pay across occupations, and to compare it with the size of the variation across countries and industries, I regress the six dependent variables on all the country, industry, and occupation indicators, and a constant. I use a restricted least squares approach whereby, for each set of coefficients (country, industry, and occupation), I constrain the weighted average of coefficients (with employment shares as weights) to be equal to 0. Next, for each set of indicators (country,

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[19] With the 2000–01 sample, I regress the three complexity variables on a broader set of variables, which include job tenure and firm tenure × job tenure, in addition to the variables used for the 2000–05 sample. Age and the two tenure variables have a positive effect on *COMPLEX*. Job tenure and age have positive and negative effects (respectively) on *REPET*, and firm tenure and age have negative effects on *MONOT*. Details are available upon request.

TABLE 3
Descriptive Statistics by Occupation

	% EWCS	% LFS	*DIMETH*	*DESCHED*	*PRATE*	*GPAY*	*PSHARING*	*STOCK*
Third EWCS (2000–01)								
Legislators, senior officials, and managers	4.32	5.71	0.379	0.352	0.074	0.068	0.126	0.045
Professionals	12.42	12.89	0.294	−0.148	0.064	0.021	0.053	0.008
Technicians and associate professionals	15.79	15.95	0.150	0.009	0.091	0.027	0.068	0.012
Clerks	14.52	14.47	0.011	0.026	0.057	0.017	0.054	0.010
Service workers and shop and market sales workers	15.79	13.77	−0.175	−0.199	0.071	0.017	0.043	0.002
Skilled agricultural and fishery workers	1.09	1.13	−0.202	−0.086	0.172	0.015	0.042	0.008
Craft and related trades workers	16.19	15.55	−0.230	−0.223	0.197	0.033	0.065	0.008
Plant and machine operators and assemblers	8.46	9.98	−0.487	−0.313	0.153	0.029	0.063	0.013
Elementary occupations	10.77	9.94	−0.283	−0.208	0.094	0.012	0.031	0.003
Armed forces	0.65	0.63	−0.071	−0.145	0.038	0.006	0.000	0.000
Fourth EWCS (2005)								
Legislators, senior officials, and managers	4.74	8.16	0.316	0.318	0.089	0.150	0.248	0.076
Professionals	15.15	13.49	0.250	−0.190	0.065	0.054	0.080	0.020
Technicians and associate professionals	16.07	16.06	0.111	−0.025	0.074	0.050	0.090	0.019
Clerks	14.80	11.06	−0.015	0.022	0.079	0.047	0.092	0.020
Service workers and shop and market sales workers	12.70	13.39	−0.164	−0.207	0.074	0.036	0.063	0.014
Skilled agricultural and fishery workers	0.74	4.35	−0.047	−0.094	0.230	0.034	0.068	0.013
Craft and related trades workers	13.37	14.32	−0.256	−0.311	0.218	0.051	0.079	0.014
Plant and machine operators and assemblers	8.00	8.82	−0.502	−0.386	0.208	0.045	0.087	0.016
Elementary occupations	13.77	9.64	−0.215	−0.283	0.121	0.025	0.044	0.012
Armed forces	0.66	0.70	−0.248	−0.201	0.053	0.000	0.000	0.000

% EWCS = percentages of employment by occupation in the sample. % LFS = percentages of employment by occupation, according to Eurostat's Labor Force Survey (LFS). Remaining columns: means of discretion and performance pay by occupation.

industry and occupation) I compute the adjusted standard deviation of coefficients, as proposed by Haisken-DeNew and Schmidt (1997).[20] Results are reported in Table 4. Three findings are worth noting. First, whether we look across countries, occupations, or industries, discretion varies much more than performance pay. Second, piece rates and profit sharing vary more than group performance pay or stock ownership. The small variation in stock ownership is particularly striking. Third, *DIMETH* varies twice as much across occupations than across countries or industries, but differences in *DESCHED* are very similar across countries, industries, and occupations.

Table 5 presents correlations among discretion, performance pay, and job characteristics. Employee discretion is positively correlated with group performance pay, profit sharing, and stock ownership, and negatively correlated with piece rates. *COMPLEX* is positively correlated with all discretion and performance pay variables, but the correlation with *PRATE* is not statistically significant. *REPET* and *MONOT* are negatively correlated with the two discretion variables and profit sharing, and are positively correlated with *PRATE.* Their correlations with stock ownership are not significant. *SUBORD* is positively correlated with discretion and all the performance pay variables except *PRATE,* and it is negatively correlated with *PRATE.* In addition, *SUBORD* is positively correlated with *COMPLEX* and negatively correlated with *REPET* and *MONOT.*

Results for the baseline regression are shown in Table 6. The model is estimated for the pooled 2000–05 surveys. *COMPLEX* has a significant positive effect on discretion and three types of performance pay—group performance pay, profit sharing, and stock ownership—and an insignificant effect on piece rates. The number of subordinates also has a positive effect on discretion and all performance pay measures except *PRATE,* whereas establishment size has a negative effect on discretion and a positive effect on performance

TABLE 4
Adjusted Standard Deviations of Country, Occupation, and Industry Coefficients, EU-15 Countries

	Country			Occupation			Industry		
	1996	2000–01	2005	1996	2000–01	2005	1996	2000–01	2005
DIMETH	0.111	0.111	0.113	0.202	0.219	0.191	0.082	0.081	0.105
DESCHED	0.108	0.127	0.150	0.156	0.214	0.227	0.104	0.157	0.179
PRATE	0.052	0.020	0.076	0.049	0.023	0.020	0.041	0.031	0.041
GPAY		0.009	0.021		0.013	0.032		0.011	0.032
PSHARING		0.017	0.038		0.027	0.056		0.037	0.070
STOCK		0.005	0.018		0.013	0.018		0.011	0.020

Square root of the weighted average of the squared deviations of the individual coefficients from the weighted mean, based on a restricted least squares regression with the following explanatory variables: a constant, 27 country indicators, 10 occupation indicators, and 15 industry indicators. The weights are employment shares per country, occupation and industry. EU-15 countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, The Netherlands, Portugal, Spain, Sweden, and United Kingdom.

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[20] Suppose there are n occupations, and suppose $\beta_1,\ldots,\beta_n$ are the occupation coefficients that we want to estimate. Let $b_1,\ldots,b_n$ be the estimated coefficients and $s_1,\ldots,s_n$ the standard errors. Let $\omega_1,\ldots,\omega_n$ be the employment shares by occupation ($\Sigma_{i=1}^{n} \omega_i = 1$). Then the adjusted standard deviation is $\hat{S}(\beta) = \sqrt{\Sigma_{i=1}^{n} \omega_i(b_i^2 - s_i^2)}$. This standard deviation controls for least squares sampling errors in the estimated coefficients.

TABLE 5
Correlations among Measures of Discretion, Performance Pay, and Job Characteristics
Pooled Data (2000–05)

	DIMETH	*DESCHED*	*PRATE*	*GPAY*	*PSHARING*	*STOCK*	*COMPLEX*	*REPET*	*MONOT*
DESCHED	0.349***								
PRATE	−0.037***	−0.008							
GPAY	0.042***	0.065***	0.095***						
PSHARING	0.057***	0.102***	0.103***	0.289***					
STOCK	0.031***	0.057***	0.042***	0.155***	0.200***				
COMPLEX	0.196***	0.098***	0.002	0.062***	0.073***	0.042***			
REPET	−0.110***	−0.102***	0.052***	−0.006	−0.014***	0.0002	−0.022***		
MONOT	−0.158***	−0.116***	0.070***	−0.003	−0.017***	−0.004	−0.057***	0.243***	
SUBORD	0.150***	0.170***	−0.009*	0.087***	0.104***	0.079***	0.166***	−0.058***	−0.089***

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

TABLE 6
Regression Results with Pooled Data (2000–05)

	DIMETH	*DISCHED*	*PRATE*	*GPAY*	*PSHARING*	*STOCK*
Complex	0.227***	0.061***	0.001	0.011***	0.018***	0.003***
	(0.008)	(0.007)	(0.003)	(0.002)	(0.003)	(0.001)
Subordinates (1–4)	0.209***	0.187***	0.007	0.012***	0.023***	0.011***
	(0.015)	(0.013)	(0.006)	(0.003)	(0.005)	(0.002)
Subordinates (5–9)	0.181***	0.216***	−0.005	0.030***	0.055***	0.007**
	(0.022)	(0.019)	(0.008)	(0.005)	(0.007)	(0.003)
Subordinates (10+)	0.260***	0.257***	0.006	0.037***	0.047***	0.018***
	(0.019)	(0.016)	(0.007)	(0.004)	(0.006)	(0.003)
Establishment size (2–4)	−0.258***	−0.148***	−0.031***	0.002	0.001	0.003
	(0.026)	(0.022)	(0.010)	(0.006)	(0.008)	(0.004)
Establishment size (5–9)	−0.301***	−0.248***	−0.021**	0.006	−0.002	0.002
	(0.026)	(0.022)	(0.010)	(0.006)	(0.008)	(0.004)
Establishment size (10–49)	−0.327***	−0.298***	−0.009	0.010*	0.001	0.003
	(0.025)	(0.021)	(0.010)	(0.006)	(0.008)	(0.004)
Establishment size (50–99)	−0.377***	−0.341***	−0.001	0.013**	0.011	0.006
	(0.027)	(0.022)	(0.010)	(0.006)	(0.008)	(0.004)
Establishment size (100–249)	−0.428***	−0.296***	0.014	0.019***	0.029***	0.007*
	(0.027)	(0.023)	(0.010)	(0.006)	(0.008)	(0.004)
Establishment size (250–499)	−0.384***	−0.253***	0.007	0.023***	0.039***	0.012***
	(0.029)	(0.025)	(0.011)	(0.007)	(0.009)	(0.004)
Establishment size (500+)	−0.423***	−0.252***	0.011	0.036***	0.061***	0.020***
	(0.027)	(0.023)	(0.010)	(0.006)	(0.009)	(0.004)
Firm tenure	0.0004	0.001***	−0.0001	0.0001	0.0003**	0.0002**
	(0.0005)	(0.0004)	(0.0002)	(0.0001)	(0.0002)	(0.0001)
Age	0.015***	0.009***	0.001	0.001**	0.004***	0.0001
	(0.002)	(0.002)	(0.001)	(0.0005)	(0.001)	(0.0003)
Age squared ($\times 10^{-4}$)	−1.691***	−0.819***	−0.211*	−0.212***	−0.558***	−0.021
	(0.292)	(0.247)	(0.112)	(0.067)	(0.092)	(0.043)
Female	−0.048***	−0.105***	−0.012***	−0.011***	−0.027***	−0.006***
	(0.009)	(0.007)	(0.003)	(0.002)	(0.003)	(0.001)
Year 2005	−0.021***	−0.091***	0.027***	0.028***	0.040***	0.012***
	(0.008)	(0.007)	(0.003)	(0.002)	(0.002)	(0.001)
Number of observations	41,425	41,425	41,425	41,425	41,425	41,425
R^2	0.158	0.179	0.104	0.052	0.095	0.031

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

The six equations have been estimated as seemingly unrelated regression equations using ordinary least squares. All regressions include a constant term, 26 country indicators, 14 industry indicators, and 9 occupation indicators. Standard errors are in parentheses.

pay (except on *PRATE*). Conducting three separate sets of regressions for 1995–96, 2000–01, and 2005 leads to similar results.[21]

I also estimate the same model using all three measures of job complexity: *COMPLEX*, *MONOT*, and *REPET*. Results from this expanded regression (available upon request) show that *COMPLEX* still has a significant positive effect on the two discretion variables and all performance pay variables except piece rates, and an insignificant effect on *PRATE*. *MONOT* and *REPET*, on the other hand, have a positive, significant effect on *PRATE* and a negative effect on all other (discretion and pay) variables.

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[21] For the 1995–96 sample, I can only use *PRATE* as a measure of performance pay. I find that *COMPLEX* has a positive effect on discretion and no significant effect on *PRATE*.

To take into account that agency problems may not be relevant to small organizations, I also limit the sample to employees working at establishments with ten or more people (approximately 86 percent of the sample). Results in Table 7 are basically the same as for the baseline regression. Similar results obtain when the model is estimated separately for the 1995–96, 2000–01, and 2005 cross-sections (and establishments with ten and more employees). When I restrict the pooled sample to establishments with fewer than ten people, *COMPLEX* has a positive effect on *DIMETH*, *DESCHED*, *GPAY*, and *PSHARING*, but has no significant effect on *STOCK*, and the effect on *PRATE* is positive and significant (at the

TABLE 7
Regression Results with Pooled Data (2000–05)
Establishments with at Least Ten Employees

	DIMETH	*DISCHED*	*PRATE*	*GPAY*	*PSHARING*	*STOCK*
Complex	0.239***	0.065***	−0.001	0.013***	0.018***	0.005***
	(0.010)	(0.008)	(0.004)	(0.002)	(0.003)	(0.002)
Subordinates (1–4)	0.205***	0.190***	0.001	0.009*	0.022***	0.008***
	(0.019)	(0.016)	(0.007)	(0.005)	(0.006)	(0.003)
Subordinates (5–9)	0.151***	0.191***	−0.005	0.028***	0.054***	0.006
	(0.025)	(0.021)	(0.010)	(0.006)	(0.008)	(0.004)
Subordinates (10+)	0.249***	0.245***	0.010	0.036***	0.047***	0.016***
	(0.019)	(0.016)	(0.007)	(0.005)	(0.006)	(0.003)
Establishment size (50–99)	−0.050***	−0.042***	0.008	0.003	0.009**	0.003
	(0.013)	(0.011)	(0.005)	(0.003)	(0.004)	(0.002)
Establishment size (100–249)	−0.100***	0.001	0.023***	0.008**	0.026***	0.003
	(0.013)	(0.011)	(0.005)	(0.003)	(0.004)	(0.002)
Establishment size (250–499)	−0.058***	0.044***	0.016**	0.011***	0.036***	0.007***
	(0.017)	(0.015)	(0.007)	(0.004)	(0.006)	(0.003)
Establishment size (500+)	−0.097***	0.042***	0.021***	0.025***	0.058***	0.015***
	(0.014)	(0.012)	(0.006)	(0.004)	(0.005)	(0.002)
Firm tenure	0.0004	−0.001**	−0.0001	0.0002	0.0003	0.0003***
	(0.001)	(0.0005)	(0.0002)	(0.0001)	(0.0002)	(0.0001)
Age	0.012***	0.007***	0.0002	0.001**	0.004***	0.0004
	(0.003)	(0.002)	(0.001)	(0.001)	(0.001)	(0.0005)
Age squared ($\times 10^{-4}$)	−1.273***	−0.654**	−0.122*	−0.263***	−0.574***	−0.064
	(0.351)	(0.298)	(0.139)	(0.088)	(0.118)	(0.057)
Female	−0.059***	−0.110***	−0.006	−0.010***	−0.026***	−0.006***
	(0.010)	(0.009)	(0.004)	(0.002)	(0.003)	(0.002)
Year 2005	−0.021**	−0.089***	0.028***	0.033***	0.050***	0.014***
	(0.009)	(0.008)	(0.004)	(0.002)	(0.003)	(0.001)
Number of observations	29,148	29,148	29,148	29,148	29,148	29,148
R^2	0.181	0.209	0.116	0.057	0.101	0.037

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*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

The six equations have been estimated as seemingly unrelated regression equations using ordinary least squares. All regressions include a constant term, 26 country indicators, 14 industry indicators, and 9 occupation indicators. Standard errors are in parentheses.

10 percent level). In samples of smaller establishments (fewer than five people and establishments where the interviewee works alone), the effect of *DIMETH* remains positive and significant, but the coefficients for *DESCHED* and the performance pay variables become insignificant.

Given that some control variables are only available for some survey years, I also estimate the baseline model with different sets of controls (not tabulated; details available upon request). For the 2000–01 data, I use firm and job tenure and an interaction term (firm tenure × job tenure) as controls. Results are similar to Table 6: *COMPLEX* has a positive effect on *DIMETH*, *DESCHED*, and all pay variables except *PRATE*. The effect on *PRATE* is positive but insignificant. Results are also similar when the sample is restricted to establishments with ten or more employees. For the 2005 sample, job tenure is not available but this sample does include information about the level of completed education and about the actual number of subordinates (*NSUBORD* instead of *SUBORD*). I use six education-level indicators, *NSUBORD*, and *NSUBORD* squared as additional controls, and find similar results for *COMPLEX*: a positive, significant effect on all dependent variables except on *PRATE*, where the effect is insignificant. Educational level has a positive effect on the two discretion variables and an insignificant effect on *PRATE*. As far as the other performance pay variables are concerned, I find that only those employees at the top educational level (postgraduate) report significantly more performance pay. The coefficients of the other education indicators are insignificant. Finally, the number of subordinates has a positive effect on all dependent variables except *PRATE*, where the effect is insignificant. The effect diminishes as the number of subordinates increases.

Finally, I estimate the baseline model by occupation. Table 8 shows the estimates of the *COMPLEX* coefficient. Some results are very similar to the full sample results. In particular, effects on discretion and *PSHARING* are positive and significant for almost every occupation, and the effect on *PRATE* is insignificant almost everywhere. Results for *GPAY* and *STOCK* are mixed, but the coefficients on *COMPLEX* are always positive or insignificant. *COMPLEX* has a positive effect on *GPAY* for six (out of nine) occupations, and a positive effect on *STOCK* for three occupations.

VII. DISCUSSION AND CONCLUSIONS

The notion of complementarity presented in Section II suggests a positive correlation between employee discretion and performance pay. The unconditional correlations in Table 5 are consistent with this prediction. Further, positive correlations among the four types of performance pay are consistent with evidence that firms use several performance measures at a time to improve precision (Gibbs et al. 2004).[22] A more puzzling result is that discretion varies much more than performance pay (see Table 4), be it across occupations, industries, or countries, indicating that relatively similar pay methods are combined with quite different levels of discretion.[23] This observation may be related to evidence that international differences in working conditions are larger than differences in earnings (Tangian 2007).

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[22] Note that incentive theory does not clearly predict a positive or negative correlation among different types of performance pay. The informativeness principle (Holmström 1979) implies that the optimal contract may be based on one or several measures of performance: more measures will be added to the contract as long as they provide information about effort that is not conveyed by the other measures.

[23] This is consistent with at least two interpretations. First, technological and cultural factors may be more important for job design (in particular, discretion) than for the design of compensation schemes. Technological factors could explain inter-industry and inter-occupation differences, while cultural factors could explain international differences. Second, it is possible that small variations in performance pay are sufficient to implement relatively large increases in discretion.

TABLE 8
Regression Results by Occupation with Pooled Data (2000–05)
Estimates of the Effect of Job Complexity

	DIMETH	*DESCHED*	*PRATE*	*GPAY*	*PSHARING*	*STOCK*	*n*
Legislators, senior officials, and managers	0.270*** (0.035)	0.137*** (0.036)	−0.018 (0.016)	0.036** (0.017)	0.034 (0.022)	0.007 (0.014)	1,864
Professionals	0.133*** (0.020)	0.067*** (0.021)	0.011 (0.008)	0.001 (0.006)	0.004 (0.008)	0.003 (0.004)	5,559
Technicians and associate professionals	0.180*** (0.020)	0.055*** (0.019)	0.002 (0.008)	0.012** (0.005)	0.019*** (0.007)	0.007** (0.003)	6,549
Clerks	0.279*** (0.021)	0.088*** (0.018)	−0.007 (0.007)	0.012*** (0.005)	0.020*** (0.007)	0.003 (0.003)	6,069
Service workers and shop and market sales workers	0.214*** (0.023)	0.039** (0.019)	0.026*** (0.007)	0.012*** (0.004)	0.022*** (0.006)	0.004* (0.002)	6,037
Skilled agricultural and fishery workers	0.167* (0.090)	0.118 (0.073)	0.019 (0.041)	−0.002 (0.015)	−0.039* (0.023)	0.001 (0.011)	389
Craft and related trades workers	0.270*** (0.022)	0.060*** (0.017)	−0.018* (0.010)	0.001 (0.005)	0.016** (0.007)	−0.002 (0.00)	6,284
Plant and machine operators and assemblers	0.299*** (0.190)	0.071*** (0.022)	0.017 (0.013)	0.011* (0.006)	0.033*** (0.009)	0.004 (0.004)	3,442
Elementary occupations	0.160*** (0.027)	−0.009 (0.020)	−0.008 (0.010)	0.020*** (0.004)	0.012** (0.006)	0.005* (0.003)	4,958

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively.

The table shows the coefficient estimates for *COMPLEX*. The six equations have been estimated as seemingly unrelated regression equations using ordinary least squares. Explanatory variables are the same as in Table 6. In the regressions for skilled agricultural workers industry indicators are not included.

Complementarity also suggests that changes in job complexity produce a positive covariation between discretion and performance pay. I find evidence of this complementarity for all types of performance pay except piece rates. Employees with more complex jobs have more discretion, and this result is robust to different measures of complexity and to different specifications. Employees with more complex jobs are also more likely to earn group-based performance pay and profit-sharing pay, and to own stock of the company they work for. This result is robust to different years and sets of control variables, although estimates by occupation are insignificant in some cases. However, for piece rates, the effect of *COMPLEX* is insignificant in almost all samples and with different sets of controls, and the effects of *REPET* and *MONOT* are usually positive and significant. Thus, the data suggest that job complexity reduces the use of piece rates.

Models based on specific knowledge (Baker 1992; Prendergast 2002) imply that input monitoring should be preferred to output monitoring, and employees should have less discretion, when jobs are less complex or more repetitive. Consistent with this model, I find that all measures of complexity have a positive effect on discretion. However, results on performance pay are mixed. On one hand, there is a positive effect of *COMPLEX* (and negative effects of *REPET* and *MONOT*) on group performance pay, profit sharing, and stock ownership, which is consistent with these models. On the other hand, however, *REPET* and *MONOT* have positive effects on piece rates, which is inconsistent with the specific knowledge argument. One possible interpretation is that employees' specific knowledge refers to the value of their contribution to team output, as in Raith (2008). If complex jobs are characterized by such specific knowledge, then group incentives would elicit the right level of input, but individual incentives would be inefficient.

Conversely, models that emphasize measurement costs, such as Lazear (1986) and Holmström and Milgrom (1991), suggest a negative effect of complexity on discretion and performance pay. In Lazear (1986), piece rates have more stringent measurement requirements than salaries and, therefore, salaries are preferred when jobs are more complex. Although there is no significant effect of *COMPLEX* on piece rates, *REPET* and *MONOT* have positive effects on piece rates, which is consistent with this view. Moreover, piece rates are positively correlated with the use of explicit production targets and are much more frequent for blue-collar and agricultural workers than for clerical and other service workers. All this suggests that piece rates are preferred when output measurement is less costly. However, as *MONOT* and *REPET* increase (or *COMPLEX* diminishes) employees have *less* discretion, which is inconsistent with the notion of complementarity between discretion and performance pay.

Holmström and Milgrom (1991) show that incentive contracts can produce distortions because employees tend to devote more effort to the tasks that have more impact on the performance measure. This means that the performance measures have to be consistent with job content. For example, piece rates are appropriate if the firm wants employees to focus on output and inappropriate if employees are expected to perform a variety of tasks that have different marginal effects on output. The negative effect of task variety (positive effect of *REPET* and *MONOT*) on piece rates is in accordance with this view. Moreover, when jobs are complex and piece rates are inappropriate, the multi-task framework is consistent with firms choosing three different options: a salary, an incentive scheme based on a broad measure of performance, or a combination of several incentive schemes. Empirical evidence suggests the third option: as job complexity increases, group performance pay, profit sharing, and stock ownership become more frequent.

The positive effect of job complexity on discretion and some types of performance pay is related with evidence that branch managers have more discretion when banks are more innovative or the environment is more volatile (Nagar 2002). It is possible that an increase in the bank's operational uncertainty makes a manager's job more complex, in which case the results of this study are consistent with Nagar (2002). The main difference is that I distinguish between four types of performance pay and find that piece rates behave in a different way. Although the finding that job complexity affects different pay methods differently is new to the literature, it is consistent with MacLeod and Parent (1999), who find that discretion reduces the probability that the firm will use piece rates or hourly wages versus other pay methods.

All in all, the findings give more support to the specific knowledge view than to the measurement cost perspective. The specific knowledge view predicts a positive effect of complexity on discretion and performance pay, and regressions show a positive effect on all measures of discretion and three measures of performance pay (group performance pay, profit sharing, and stock ownership). Thus, results for discretion and group and firm-wide incentives suggest that, when jobs are more complex, firms prefer to give discretion even if the available incentive schemes are based on imperfect measures of performance. In other words, the benefits from a better use of (specific) information are larger than the costs of imperfect measurement (e.g., lack of congruency). However, two important qualifications must be made.

First, unlike other incentive schemes, piece rates are mostly driven by performance measurement considerations: increases in job complexity are associated with reductions in the use of piece rates, exactly as predicted by the measurement cost approach. This suggests that, when firms introduce piece rates, specific knowledge is not a major concern. Moreover, the negative covariation between discretion and piece rates speaks against complementarity, and suggests that (unlike other forms of performance pay) piece rates are not introduced as a way to decentralize decision making.

Second, the negative effect of complexity on piece rates and positive effect on the other incentive schemes may have two possible readings. From a specific-knowledge perspective, one can argue that, as complexity increases, firms change the type of performance pay to make employees accountable for their presumably wider decision rights. However, from a measurement-cost perspective, one can also argue that performance pay changes to more accurately assess performance and minimize the costs of bad measurement. While most theoretical analyses have focused on the choice of performance pay versus straight salaries, this study suggests that the choice among different incentive schemes deserves more attention.

This study is subject to several limitations. First, the data are cross-sectional, and employee fixed effects cannot be estimated. If unobserved ability is correlated with complexity, then the coefficients on the job complexity variables will be biased. Second, I cannot control for firm characteristics other than industry and establishment size. In particular, I cannot control for whether the firms are family firms, entrepreneurial firms, partnerships, start-ups, private, or publicly traded. The data also do not provide me the ability to control for the risk/volatility of the firm's activity. Ideally, it would be important to analyze whether the effect of job complexity remains after controlling for environmental risk, but the EWCS does not include firm identifications and it is not possible to match employee responses with other firm-level data. Third, the measures for discretion, performance pay, and job complexity are all self-reported. While I can provide some evidence of internal validity, I cannot establish external validity. To do so, I would need to match employee responses with data from other sources, but the EWCS does not allow me to do so.

Despite these caveats, I think this study makes an interesting contribution. It proposes a different way to analyze contract variation, focusing on job complexity instead of environmental risk. It shows that the two main theoretical perspectives on discretion and performance pay generate different predictions, and tests them using a large data set of individual employees. The empirical analysis suggests that specific knowledge is important to understand the use of group and firm-wide incentives, but also suggests that piece rates are primarily driven by measurement costs.

APPENDIX
MEASURES OF EMPLOYEE DISCRETION

I conduct exploratory and confirmatory factor analyses of the six discretion variables (*ORDER*, *METHODS*, *SPEED*, *BREAKS*, *HOURS*, and *DAYSOFF*). For the exploratory analysis I use a principal-components factoring method with oblique rotation, as in Ittner and Larcker (1995) and Nagar (2002). I standardize the six variables to have 0 mean and a standard deviation equal to 1 and I conduct a separate analysis for each survey. Only two factors have eigenvalues greater than 1. *METHODS*, *ORDER*, and *SPEED* load more heavily on the first factor, and *BREAKS*, *HOURS*, and *DAYSOFF* on the second one. Rotated factors account for a large percentage of total variance: 65.45 percent (1995–96), 68.26 percent (2000–01), and 73.79 percent (2005), and none of the questions loads greater than 0.45 on both factors. For *METHODS*, *ORDER*, and *SPEED*, Cronbach's alphas are 0.78 (1995–96), 0.77 (2000–01), and 0.76 (2005), respectively; for *BREAKS*, *HOURS*, and *DAYSOFF*, Cronbach's alphas are 0.41 (1995–96), 0.54 (2000–01), and 0.66 (2005), respectively.

For the confirmatory analysis I try two alternative models: one where the six variables measure the same latent construct (employee discretion), and an alternative one where *METHODS*, *ORDER*, and *SPEED* measure one construct (discretion on work methods) and *BREAKS*, *HOURS*, and *DAYSOFF* measure another one (discretion on work scheduling), in which case I allow the constructs to be correlated. I estimate the two models using an asymptotically distribution-free estimation procedure (Browne 1982). Both models have an excellent fit, but the two-factor model is clearly superior in terms of adjusted goodness of fit (AGFI) and root mean-squared residuals (RMR).[24]

Based on these analyses I define the index for discretion over work methods as $DIMETH = (METHODS + ORDER + SPEED)/3$, and the index for discretion over work schedules as $DISCHED = (BREAKS + HOURS + DAYSOFF)/3$, where the six base variables are standardized (0 mean, variance equal to 1).

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[24] For the 1995–96 data, AGFI is 0.988 in the one-factor model and 0.997 in the two-factor model, and RMRs are 0.011 and 0.004, respectively. For the 2000–01 data, the AGFI is equal to 1 for both models, but the standardized RMR is 0.017 in the one-factor model and 0.006 in the two-factor model. For the 2005 data, AGFI is 0.959 for the one-factor model and 0.993 for the two-factor model, and RMRs are 0.103 and 0.025, respectively.

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BOOK REVIEW

Stephen A. Zeff, Editor

Editor's note: Two copies of books for review should be sent to the Book Review Editor: Stephen A. Zeff, Rice University, Jesse H. Jones Graduate School of Management, 6100 Main St., Houston, TX 77005. The policy of *The Accounting Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.

JEFFREY UNERMAN, JAN BEBBINGTON, and BRENDAN O'DWYER, *Sustainability Accounting and Accountability* (London, U.K.: Routledge, 2007, ISBN 13: 978-0-415-38489-6, pp. xix, 362).

Sustainability Accounting and Accountability is a book of chapters by various authors, including the editors, in which the role of accounting in regard to sustainability is described. The hope offered in the book is that accounting's role in promoting economic growth and, as a consequence, contributing to an unsustainable planetary future can be altered so that the part it plays leads to planetary survival. Although the editors do make those claims, they do it with a dose of skepticism, and those views are echoed by many of the authors of the chapters.

Before the content of the book is reviewed, I would like to propose where I think the book fits into the accounting curriculum. Sustainable development, or the recognition that the planet cannot survive unfettered growth, has become one of the most important issues of our time. Recognizing that we need to live within environmental constraints and that issues of social justice cannot be ignored are two factors critical to the future survival of humankind. Many M.B.A. programs have started to include sustainability in their curriculum, and as part of an accounting course for those programs this book provides some excellent readings on the topic. Both undergraduate and graduate accounting programs in the U.S. have mainly ignored sustainability, as have most of the mainstream accounting research outlets. This is unfortunate. The book describes how the important roles that accounting has as concerns sustainability and making students aware of the issue in an accounting context would provide a first step in getting accountants involved. Certainly, for a Ph.D. program in accounting, this book and other readings should be part of the curriculum. The book provides a good overview of the research literature in the field and makes many suggestions as to future research. For both undergraduate and specialized master's programs in accounting, sustainability, like ethics and globalization, must be given a prominent place.

The book is divided into four parts. In the first part there are two chapters that provide a context for the issues that are presented in the remainder of the book. External reporting forms the basis of the second part, and the third part focuses on internal sustainability accounting activities. Other sustainability issues are in the fourth part, and the book ends with a brief conclusion by the editors.

In Part I, Chapter 1, Ian Thomson provides a mapping of the literature on sustainability accounting and in accountability research. The author claims to have drawn the maps based on a review of about 700 articles dealing with these themes. Categories that are mapped include research methodologies, geographic location, purpose, entity, topic, evaluator framework, timescale, people researched, and publication media.

In the second chapter of Part I, Jesse Dillard provides an underlying theoretical basis for sustainability accounting. Although Professor Dillard sees that social accounting (the overall field for which sustainability accounting is a subset) has a pragmatic origin, he believes that it falls under the rubric of critical accounting. Since social accounting is about acting in the public interest, this provides it with moral legitimacy and makes it congruent with critical theory. Although Professor Dillard sees some limitations in this theoretical mapping, he does make some forceful points supporting it.

Part II begins with a chapter by Nola Buhr in which she explores the history and rationales for sustainability reporting. Professor Buhr is a bit skeptical as to whether sustainable reporting actually exists. Despite her doubts, she does a good job of providing a historical overview of aspects of certain elements of sustainability reporting.

In terms of rationales, both voluntary and mandated, justifications are presented with a question as to whether either can succeed alone. Relying on either business or government to solve the problem will not result in a satisfactory conclusion. Professor Buhr thinks the only solution is engaging all sectors of society in the cause of sustainability.

Carol Adams and Venkat Narayanan in the second chapter in Part II provide an overview of the many sustainability reporting schemes that have been developed and utilized by various organizations. Bodies such as the Global Reporting Initiative (GRI), International Standards Organization (ISO), and the World Business Council for Sustainable Development (WBCSD) have created sustainability guidelines for both corporate behavior and for reporting. In this chapter, the authors describe and critique these and other guidelines, recognizing some of the limitations of these approaches.

In Chapter 5, Jeffrey Unerman (one of the editors) discusses the role of stakeholder involvement in sustainability reporting. Without awareness of stakeholder needs, it would be impossible to provide effective sustainability reporting. However, Professor Unerman shows that, while obtaining meaningful stakeholder involvement concerning sustainability may be theoretically possible, it is operationally difficult to do. Further, he believes that what is currently practiced as sustainability reporting is really public relations.

Stakeholders' perceptions of sustainability reporting provide the basis for Carol Ann Tilt's chapter. She describes the stakeholders and assesses their perceived needs for information about social and environmental phenomena. Although most stakeholders see some value in sustainability reporting, shareholders and investors tend to be interested in financial implications of sustainability and, I would argue, in short-term impacts. What Professor Tilt terms secondary stakeholders (consumers, NGOs, the general public) are interested in much broader information, although they are skeptical about the information that the companies provide. She makes suggestions for further research to determine the needs of secondary stakeholders in regard to sustainability research.

In Part II, Chapter 7, Craig Deegan provides an extensive analysis of organizational legitimacy. In sustainability accounting research, legitimacy is postulated as being a motivator for firms to disclose sustainability data. Although it is only one of many theories explaining these disclosures, it is a theory that has been tested in many studies. Professor Deegan's exposition is a very thorough examination of legitimacy theory, and this chapter provides wonderful background for any researcher thinking of utilizing this theory in their work.

Another theory that can be used to explain sustainability disclosure is institutional theory. Carlos Larrinaga-González, in Chapter 8, expounds on this theory, recognizing that its application to sustainability reporting has been limited. However, he makes a case as to why this theory can be used to explain how companies facing similar pressures and commitments may have shared participation in sustainability management and reporting schemes.

David Owen provides a critique of assurance practices and sustainability in Chapter 9. With the growth of sustainability reporting, the need for these reports to be audited has greatly increased. Professor Owen describes the assurance practices, including examples of the assurance statements made by other auditors. He also critically analyzes current practices.

Part II concludes with a chapter written by Markus J. Milne and Rob Gray on the future prospects for sustainability reporting. The authors analyze trends in sustainability reporting, noting that the number of companies providing stand-alone social/environmental or sustainability reports has greatly increased since 1990. The authors do question the quality of what has been produced, but recognize the dearth of studies attesting to quality and the subjectivity of the assessment. What I found most interesting was that the authors' questioning whether all of this reporting was a positive event. Do companies just try to mask their unsustainable behavior with these reports? Can reporting at the firm level really be meaningful when sustainability is much more of a macro problem?

Part III is concerned with internal sustainability activities. In Chapter 11, Nicolas Antheaume discusses the concept of full costing, which basically means that a product or services price is comprised of all costs, including social costs. A major component of these social costs is those concerned with the environment. Professor Antheaume describes some of these costs and justifies their inclusion from both a theoretical and practical perspective.

Jan Bebbington (one of the editors), in Chapter 12, discusses whether a focus on accounting for sustainability leads to organizational change. She describes what constitutes organizational change and how accounting can possibly contribute to the change. Although Professor Bebbington describes some changes in routines and processes, her overall conclusion is that sustainability accounting has not yet led to any real organizational change.

In Chapter 13, Amanda Ball and Suzana Grubnic explain the importance of the public sector in advancing the sustainability agenda. Governments and other public service organizations have made commitments and promises to achieve certain goals in terms of sustainability. Providing transparency on their achievements in furthering the sustainability agenda through sustainability accounting is needed. Furthermore, these organizations need to operate in a sustainable manner and to account for this.

Andrea B. Coulson, in the last chapter of Part III, discusses the issue of sustainable finance. Environmental or social assessment has become the norm in assessing risk for lenders. Professor Coulson describes this phenomenon and on the reporting of these types of decisions. In terms of project finance, she discusses the "equator principles" and their impact on project lending decisions. These principles force banks to consider the environmental and social implications of their loans and have influenced bank decisions.

The last part of the book contains three chapters dealing with other issues that are pertinent to sustainability accounting that were not addressed in the previous parts. Brendan O'Dwyer (an editor) discusses non-governmental organizations (NGOs) and their role in sustainability. According to the author, NGOs have been major players in sustainability, and there is little accountability for their impacts. Professor O'Dwyer describes NGOs and their impacts and also explains why it is difficult to assess their impacts. Although some NGOs have made attempts to provide accountability, overall there are few good reports. The author feels that accountability is needed and reporting mechanisms should be developed.

Colin Dey, in Chapter 16, discusses the uses of silent and shadow accounts in determining the impact of the corporation on sustainability. Many companies produce stand-alone social/environmental/sustainability reports (SR), and there have been some questions as to whether these reports are anything more than public relations documents (echoed by Milne and Gray in Chapter 10). Silent accounts are from corporate sources other than the SR, and shadow accounts are from sources independent from the corporation (e.g., an environmental protection agency). Professor Dey outlines research that compares these accounts with what the companies report in their SRs. He also makes a number of suggestions for the future use of these accounts.

In the final chapter, David Collison, John Ferguson, and Lorna Stevenson discuss the role that sustainability accounting has in education. The authors first discuss the role of education in society, focusing on curriculum. They then state their belief that, for sustainability accounting to succeed, it may require that accounting disassociate itself from neoclassical economic theory. In the second part of the chapter, they describe the impact of sustainability courses in British and Australian universities.

The book also contains an introduction and a conclusion by the editors. In the introduction, the editors describe the issues and their motivations for creating the book. They also provide a very good summary and interpretation of each of the articles. In the conclusion, they discuss the limitations of sustainability accounting, and they are somewhat hopeful that the field can grow and mature.

In conclusion, I would like to add that, for researchers who have an interest in sustainability and in accounting, the contents of this book provide a good place to begin a literature review. The literature cited by the authors, together with the various research paradigms and perspectives they describe, provide a good foundation for sustainability research. It should prove to be an excellent sourcebook for sustainability accounting.

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Errata

The publisher, American Accounting Association, regrets our error in "Exchange Guidance is the Fundamental Demand for Accounting," by Gregory B. Waymire in the Volume 84, Issue 1, January 2009 issue of *The Accounting Review.* We incorrectly entered the author's changes in the reference section. The correct references are:

Basu, S., M. Kirk, and G. Waymire. 2008. Transaction records, impersonal exchange, and division of labor. Working paper, Emory University.

Basu, S., J. Dickhaut, G. Hecht, K. Towry, and G. Waymire. 2009. Recordkeeping alters economic history by promoting reciprocity. *Proceedings of the National Academy of Sciences of the U.S.A.* 106 (4): 1009–1014.

EDITORIAL POLICY AND STYLE INFORMATION

EDITORIAL POLICY

According to the policies set by the Publications Committee (which were endorsed by the Executive Committee and were published in the *Accounting Education News*, June 1987), *The Accounting Review* "should be viewed as the premier journal for publishing articles reporting the results of accounting research and explaining and illustrating related research methodology. The scope of acceptable articles should embrace any research methodology and any accounting-related subject, as long as the articles meet the standards established for publication in the journal ... No special sections should be necessary. The primary, but not exclusive, audience should be—as it is now—academicians, graduate students, and others interested in accounting research."

The primary criterion for publication in *The Accounting Review* is the significance of the contribution an article makes to the literature. Topical areas of interest to the journal include accounting information systems, auditing and assurance services, financial accounting, management accounting, taxation, and all other areas of accounting, broadly defined. The journal is also open to all rigorous research methods.

The efficiency and effectiveness of the editorial review process is critically dependent upon the actions of both authors submitting papers and the reviewers. Authors accept the responsibility of preparing research papers at a level suitable for evaluation by independent reviewers. Such preparation, therefore, should include subjecting the manuscript to critique by colleagues and others and revising it accordingly prior to submission. The review process is not to be used as a means of obtaining feedback at early stages of developing the research.

Reviewers and editors are responsible for providing constructive and prompt evaluations of submitted research papers based on the significance of their contribution and on the rigor of analysis and presentation.

MANUSCRIPT PREPARATION AND STYLE

The Accounting Review's manuscript preparation guidelines follow *The Chicago Manual of Style* (15th ed.; University of Chicago Press). Another helpful guide to usage and style is *The Elements of Style*, by William Strunk, Jr., and E. B. White (Macmillan). Spelling follows *Webster's Collegiate Dictionary.*

FORMAT

1. All manuscripts should be formatted in 12-point font on 8 1/2 x 11" paper and should be double-spaced, except for indented quotations.
2. Manuscripts should be as concise as the subject and research method permit, generally not to exceed 7,000 words.
3. Margins should be at least one inch from top, bottom, and sides.
4. To promote anonymous review, authors should not identify themselves directly or indirectly in their papers or in experimental test instruments included with the submission. Single authors should not use the editorial "we".
5. A cover page should show the title of the paper, all authors' names, titles and affiliations, email addresses, and any acknowledgments.

Pagination: All pages, including tables, appendices and references, should be serially numbered. Major sections should be numbered in Roman numerals. Subsections should not be numbered.

Numbers: Spell out numbers from one to ten, except when used in tables and lists, and when used with mathematical, statistical, scientific, or technical units and quantities, such as distances, weights and measures. For example: *three days; 3 kilometers; 30 years.* All other numbers are expressed numerically.

Percentages and Decimal Fractions: In nontechnical copy use the word percent in the text.

Hyphens: Use a hyphen to join unit modifiers or to clarify usage. For example: *a cross-sectional equation; re-form.* See *Webster's* for correct usage.

Keywords: The abstract must be followed by at least three keywords to assist in indexing the paper and identifying qualified reviewers.

Data Availability: A line immediately following the Keyword identifiers should indicate whether the data are available (see "Data Availability" later in this statement).

ABSTRACT/INTRODUCTION

An Abstract of about 100 words (150 maximum) should be presented on a separate page immediately preceeding the text. The Abstract should concisely inform the reader of the manuscript's topic, its methods, and its findings. Keywords and the Data Availability statements should follow the Abstract. The text of the paper should start with a section labeled "I. Introduction," which provides more details about the paper's purpose, motivation, methodology, and findings. Both the Abstract and the Introduction should be relatively nontechnical, yet clear enough for an informed reader to understand the manuscript's contribution. The manuscript's title, but neither the author's name nor other identification designations, should appear on the Abstract page.

TABLES AND FIGURES

The author should note the following general requirements:

1. Each table and figure (graphic) should appear on a separate page and should be placed at the end of the text. Each should bear an Arabic number and a complete title indicating the exact contents of the table or figure. Tables and figures should define each variable. The titles and definitions should be sufficiently detailed to enable the reader to interpret the tables and figures without reference to the text.
2. A reference to each graphic should be made in the text.
3. The author should indicate where each graphic should be inserted in the text.
4. Graphics should be reasonably interpreted without reference to the text.
5. Source lines and notes should be included as necessary.

Equations: Equations should be numbered in parentheses flush with the right-hand margin.

DOCUMENTATION

Citations: Within-text citations are made using an author-year format. Cited works must correspond to the list of works listed in the "References" section. Authors should make an effort to include the relevant page numbers in the within-text citations.

1. In the text, works are cited as follows: author's last name and year, without comma, in parentheses. For example: one author, (Berry 2003); two authors, (Fehr and Schmidt 2003); three or more authors, (Dechow et al. 1998); more than one work cited, (Cole and Yakushiji 1984; Dechow et al. 1995; Levitt 1998); with two works by the same author(s), (Nelson 2003, 2005).
2. Unless confusion would result, do not use "p." or "pp." before page numbers. For example, (Dechow and Dichev 2002, 41–42).
3. For cited works that include more than one work by an author (or same co-authors) that are published in the same year, the suffix a, b, etc., is to follow the date in the within-text citations and in the "References" section. For example: (Baiman and Rajan 2002a, 2002b).
4. When the author's name is mentioned in the text, it need not be repeated in the citation. For example: "Cohen et al. (2005) provide ..."
5. Citations to institutional works shoulduse acronyms or short titles where practicable. For example: (NCFFR, The Treadway Commission 1987).
6. If the paper refers to statutes, legal treatises, or court cases, citations acceptable in law reviews should be used.

Reference List: Every manuscript must include a "References" section that contains only those works cited within the text. Each entry should contain all information necessary for unambiguous identification of the published work. Use the following formats (which follow *The Chicago Manual of Style*):

1. Arrange citations in *alphabetical order* according to the surname of the first author or the name of the institution or body responsible for the published work.
2. Arrange citations in *chronological order* when two or more works are by the same first author (regardless of co-authors). Two or more works by the *same author(s)* published in the same year are distinguished by letters a, b, etc., after the year.
3. Use authors' initials instead of proper names.
4. For two or more authors, separate authors with a comma, including a comma before "and" (Dechow, P. M., R. Sloan, and A. Sweeney).
5. Date of publication follows the author's (authors') name(s).
6. Titles of journals or newspapers should not be abbreviated.

Sample entries are as follows:

Baiman, S., and M. Rajan. 2002a. The role of information and opportunism in the choice of buyer-supplier relationships. *Journal of Accounting Research* 40 (2): 247–278.

———, and ———. 2002b. Incentive issues in inter-firm relationships. *Accounting, Organizations and Society* 27 (3): 213–238.

Berry, R. 2003. Testimony before the Senate Committee on Homeland Security and Governmental Affairs Permanent Subcommittee on Investigations. November 18. Available at: http://hsgac.senate.gov/_files/111803berry.pdf.

Cohen, D., A. Dey, and T. Lys. 2005. The Sarbanes Oxley Act of 2002: Implications for compensation structure and risk-taking incentives of CEOs. Working paper, New York University, University of Chicago, and Northwestern University.

Cole, R., and T. Yakushiji, eds. 1984. *The American and Japanese Auto Industries in Transition*. Ann Arbor, MI: University of Michigan.

Dechow, P. M., R. Sloan, and A. Sweeney. 1995. Detecting earnings management. *The Accounting Review* 70 (2): 193–225.

———, S. P. Kothari, and R. L. Watts. 1998. The relation between earnings and cash flows. *Journal of Accounting and Economics* 25: 133–168.

———, and I. Dichev. 2002. The quality of accruals and earnings: The role of accrual estimation errors, *The Accounting Review* 77 (Supplement): 35–59.

Easton, P. 2003. Discussion of: The predictive value of expenses excluded from pro forma earnings. *Review of Accounting Studies* 8: 175–183.

Engel, E., R. Hayes, and X. Wang. 2007. The Sarbanes-Oxley Act and firms' going-private decisions. *Journal of Accounting and Economics* (forthcoming).

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Fehr, E., and K. Schmidt. 2003. A theory of fairness, competition, and cooperation. In *Advances in Behavioral Economics*, edited by C. Camerer, G. Loewenstein, and M. Rabin, 271–296. New York, NY: Princeton University Press.

Janis, I. L. 1982. *Groupthink: Psychological Studies of Policy Decisions and Fiascoes*. Boston, MA: Houghton Mifflin.

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Maggi, G. 1999. The value of commitment with imperfect observability and private information. *RAND Journal of Economics* (Winter) 30: 555–574.

National Commission on Fraudulent Reporting (the Treadway Commission). 1987. *Report of the National Commission on Fraudulent Financial Reporting*. Washington, D.C.: NCFFR.

Nelson, M. W. 2003. Behavioral evidence on the effects of principles- and rules-based standards. *Accounting Horizons* 17 (1): 91–104.

———. 2005. A review of experimental and archival conflicts-of-interest research in auditing. In *Conflicts of Interest: Challenges and Solutions in Business, Law, Medicine, and Public Policy*, edited by D. A. Moore, D. M. Cain, G. Loewenstein, and M. H. Bazerman. Cambridge, U.K.: Cambridge University Press.

Rigdon, E. E., R. E. Schumacker, and W. Wothke. 1998. A comparative review of interaction and nonlinear modeling. In *Interaction and Nonlinear Effects in Structural Equation Modeling*, edited by R. E. Schumacker, and G. A. Marcoulides, 1–16. Mahwah, NJ: Erlbaum Associates.

Schultz, E., and T. Francis. 2002. Companies profit on workers' deaths through "dead peasants" insurance. *Wall Street Journal* (April 19): 1.

Securities and Exchange Commission (SEC). 2002. *Certification of Disclosure in Companies' Quarterly and Annual Reports*. Release Nos. 33-8124, 34-46427. Washington, D.C.: SEC.

U.S. House of Representatives. 2002. The Sarbanes-Oxley Act of 2002. Public Law 107-204 [H. R. 3763]. Washington, D.C.: Government Printing Office.

Footnotes: Footnotes are not used for documentation. Textual footnotes should be used only for extensions and useful excursions of information that if included in the body of the text might disrupt its continuity. Footnotes should be inserted using the "footnote" or "endnote" feature of the word processing software which will automatically number the footnotes throughout the manuscript with superscript Arabic numerals.

SUBMISSION OF MANUSCRIPTS

Authors should note the following guidelines for submitting manuscripts:

1. Manuscripts currently under consideration by another journal or publisher should not be submitted. The author must state upon submission that the work is not submitted or published elsewhere.
2. For manuscripts reporting on field surveys or experiments: If the additional documentation (e.g., questionnaire, case, interview schedule) is sent as a separate file, then all information that might identify the author(s) must be deleted from the instrument.
3. Manuscripts should be submitted via email as Microsoft Word or PDF file to the Senior Editor, Steven Kachelmeier, at email address tar@mccombs.utexas.edu. Please submit separate files for (1) the manuscript's title page with identifying information (not forwarded to reviewers), (2) the manuscript with title page and all other identifying information removed, and (3) any necessary supplemental files, such as experimental instructions and/or response memoranda on invited revisions. The body or subject line of the email should also indicate the submission fee receipt code from AAA (see step 4 below).
4. A submission fee is required unless explicitly waived by the editor for invited revisions of previous submissions. The submission fee should be paid online (VISA or MasterCard only) at: https://aaahq.org/AAAforms/journals/tarsubmit.cfm. If unable to pay online, a check in U.S. funds, made payable to the American Accounting Association, may be sent to Ms. Mary Capps, Editorial Assistant, *The Accounting Review*, The University of Texas at Austin, McCombs School of Business, Department of Accounting CBA 4M.202, 1 University Station B6400, Austin, TX 78712-0211. The submission fee in U.S. funds is $200.00 for members and $400.00 for nonmembers of the AAA. The submission fee is nonrefundable.
5. Revisions must be submitted within 12 months from the decision letter inviting a revision.

COMMENTS

The Accounting Review welcomes submissions of comments on previous *TAR* articles. Comments on articles previously published in *The Accounting Review* will generally be reviewed by two reviewers, usually including an author of the original article (to assist the editor in evaluating whether the submitted comment represents the prior article accurately) and an additional reviewer who is independent of the original article. If a comment is accepted for publication, the original author will generally be invited to reply. All other editorial requirements, as enumerated above, apply to proposed comments.

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POLICY ON DATA AVAILABILITY

The following policy was adopted by the Executive Committee in its 1989 meeting. "An objective of (*The Accounting Review, Accounting Horizons, Issues in Accounting Education*) is to provide the widest possible dissemination of knowledge based on systematic scholarly inquiries into accounting as a field of professional research, and educational activity. As part of this process, authors are encouraged to make their data available for use by others in extending or replicating results reported in their articles. Authors of articles which report data dependent results should footnote the status of data availability and, when pertinent, this should be accompanied by information on how the data may be obtained."

MARCH 2009 PLACEMENT ADS

The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The ***Review*** *is published in January, March, May, July, September, and November. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, ATTENTION: ADVERTISING DEPT. All replies to box numbers should be on separate sheets to facilitate forwarding.*

201 TEXAS TECH UNIVERSITY, Rawls College of Business is soliciting applications for a tenure-track position in Accounting (all ranks) to begin Fall 2009. The Area of Accounting's primary teaching preference is Taxation; however, other teaching interests will be considered. A professorship will be considered for qualified candidates at the Associate Professor level and above. Candidates should have a strong commitment to publishing scholarly research in high-quality academic journals, demonstrating superior teaching at the undergraduate and master's levels, and actively participating in doctoral education. Other responsibilities include participation in department, college, and university activities. Candidates must have a doctorate from an AACSB International-accredited university. Salary and benefits are competitive. Interested applicants should submit letters of interest, *curriculum vita,* and list of references, to the Chair of the Recruiting Committee via email to: ralph.viator@ttu.edu; or postal mail to: Professor Ralph Viator, Area of Accounting, Rawls College of Business, Texas Tech University, Lubbock, TX 79409-2101. Review of applications will begin immediately and continue until the position is filled. The Rawls College of Business is an Equal Opportunity Employer. Women and minorities are encouraged to apply.

202 DEPAUL UNIVERSITY, School of Accountancy and MIS invites applications for a tenure-track position at the Assistant, Associate, or Full Professor level starting in Fall 2009. Candidates must hold a doctoral degree in Accounting from an AACSB-accredited school. ABDs will be considered if completion of dissertation is anticipated by starting date. Candidates should demonstrate potential for success in scholarly research and excellence in teaching. Qualified individuals in all specialty areas of accounting will be considered. Salary and benefits are competitive with AACSB schools. Review of applications will begin immediately and will continue until the position is filled. Interested applicants should submit *curriculum vita,* samples of scholarly work, teaching evaluations, and two letters of reference to: Phillip Chomiak, Coordinator of Faculty and Curriculum School of Accountancy and MIS, DePaul University, One East Jackson Blvd, Chicago, IL 60604; Email: pchomiak@depaul.edu. Please submit applications by July 25th if you wish to be considered for an interview at the AAA Annual Meeting in New York City. Information about DePaul University can be found at: http://www.depaul.edu. Information about the School of Accountancy and MIS can be found at: http://accountancy .depaul.edu.

203 UNIVERSITY AT ALBANY, STATE UNIVERSITY OF NEW YORK, Department of Accounting invites applications for one tenure-track position at the Assistant/Associate Professor level starting September 2009, subject to budgetary approval. Candidates should have a doctoral degree or be ABD in Accounting. Candidates with strong research and teaching interests in Auditing, Assurance, and/or Forensic-related areas are preferred. Other areas will be considered. Evidence of a strong commitment to scholarly research and excellence in teaching, and a demonstrated ability to work with and/or instruct diverse groups of people is required. CPA and/or professional experience is highly desirable. Candidates are requested to submit their *vitae* and contacts for three references by email to: Ingrid E. Fisher, Accounting Search Chair, Department of Accounting & Law, School of Business, University at Albany, State University of New York, Albany, NY 12222; Email: ifisher@uamail.albany.edu. Review of applications will begin immediately and continue until the position is filled.

204 DREXEL UNIVERSITY, LeBow College of Business, Department of Accounting and Taxation invite applications for the position of Department Head. Candidates must have an earned doctorate in Accounting; and possess a record of scholarship commensurate with appointment as a tenured Professor of Accounting. Responsibilities include providing leadership, building on its established reputation for teaching excellence, supporting scholarship and research, external relations, and fundraising. The Department of Accounting and Taxation has 12 full-time faculty members, including two chaired professorships. Located in Philadelphia's University City area, Drexel's LeBow College of Business is AACSB-accredited at the graduate and undergraduate levels and offers doctorate, M.B.A., Executive M.B.A., M.S. in Accounting, M.S. in Taxation, and undergraduate degrees. The LeBow College focuses on research and the Department of Accounting and Taxation has a highly productive faculty. Submit your application and supporting materials at: https://www.drexeljobs.com. Drexel University is an Affirmative Action/Equal Opportunity Employer.

205 CENTRAL CONNECTICUT STATE UNIVERSITY invites applications for a tenure-track position in accounting at the Assistant, Associate, or Full Professor level beginning in the Fall 2009 semester. Applicants should have an earned doctorate in accounting from an AACSB-accredited school or equivalent. Professional certification and/or experience are desirable. Teaching interest in financial, auditing or AIS is preferred. Applicants must have a commitment to excellence in teaching and scholarship. To begin the application process, please complete the Application Cover Page at: http://www.ccsu.edu/AffAction/. Send the cover page, along with a letter of application, your resume, and the names, addresses, and telephone numbers of three references electronically to: Professor Lawrence Grasso GrassoLa@ccsu.edu. Applications received by January 15, 2009 will receive preference of review. CCSU aggressively pursues a program of Equal Employment and Education Opportunity and Affirmative Action.

206 NORTHEASTERN ILLINOIS UNIVERSITY is a state-supported institution located in a residential neighborhood in the northwest section of Chicago. The University serves a culturally diverse student population of approximately 12,000. Applications are invited from candidates with a Ph.D./D.B.A. degrees in Accounting from AACSB-accredited schools. ABDs in advanced dissertation states will be considered for non-tenure-track appointment. Currently, one or two tenure-track positions, pending budget approval, at the Assistant/Associate Professor rank are available. Teaching areas are Accounting Principles, Financial Accounting, and Contemporary Financial Accounting at the undergraduate and graduate level. Demonstrated potential for excellent teaching and research is required. Positions will start in August 2009. Send application letter, *vitae* with e-mail address and names and contact information of three references, and copy of transcripts via regular mail to: Dr. Rasoul Rezvanian, Chair, Accounting, Business Law and Finance Department, College of Business and Management, Northeastern Illinois University, 5500 N. St. Louis Ave., Chicago, IL 60625; Email: r-rezvanian@neiu.edu. Review of applications starts immediately and continues until the positions are filled. AAO/EEO.

207 CALIFORNIA STATE UNIVERSITY, LOS ANGELES invites applications for a full-time Assistant Professor position in the areas of International Accounting Standards, Accounting Information Systems, Governmental Accounting, Tax Accounting, Financial, Managerial, Auditing, and/or Forensic Accounting. Start date is September 1, 2009. A doctoral degree must be from an accredited institution of higher education in accounting or a closely related field. ABDs will be considered. Ph.D. or equivalent is required for tenure. Preference will be given to candidates with Ph.D. or equivalent at the time of employment. Please send a letter of application, *curriculum vitae*, three letters of recommendation, and official transcript from institution awarding highest degree to: Dr. Greg Kunkel, Chair, Department of Accounting, College of Business and Economics, CSULA, 5151 State University Drive, Los Angeles, CA 90032-8120. Please see detailed descriptions of positions at http://www.calstatela.edu/academic/position/csla_fac.htm. An Equal Opportunity/Title IX Employer.

208 POSITION WANTED, I am seeking an Associate Professor of Accounting or a Professor of Accounting position at a university within the United States. My teaching expertise is in the auditing and financial accounting areas. Student evaluations indicate my teaching performance is rated above 4 on a five-point scale, where 5 represents "excellent teaching." I have written and published 35 articles in refereed journals and presented papers at 32 conferences. My research interest are measuring the level of effectiveness of red flags in detecting fraud and determining which of 78 factors influence the level of job satisfaction of accounting professions. If your department is interested in contacting me or arranging a campus interview, please call (956) 566-2966, Email: glenmoyes@utpa.edu; or mail to: Glen D. Moyes, 1107 Levington Circle #3, Edinburg, Texas 78539.

209 CASE WESTERN RESERVE UNIVERSITY, Weatherhead School of Management, invites applications for Assistant Professor of Accountancy for the academic year 2009–2010. Job qualifications: Required qualifications include a doctorate in accountancy and a strong interest in research. Evidence of quality teaching is desired. Although candidates with a specialization in any accountancy area are invited to apply, we prefer those interested in the auditing and managerial areas. We also require a professional certification (e.g., CPA, CMA), and relevant professional experience. The Department offers B.S. in Accountancy, Master of Accountancy, and Ph.D. degrees. Department faculty are also heavily involved in the M.B.A. program. All programs are AACSB-accredited. Additional information can be found at: http://weatherhead.case.edu/acct. Application procedure: Send *curriculum vita* and other materials (e.g., research materials, teaching evaluations) to Elaine Iannicelli at: eri@case.edu. Applications from women and minority candidates are especially welcome. In employment as in education, Case Western Reserve University is committed to Equal Opportunity and Diversity.

210 TOWSON UNIVERSITY has two tenure-track positions in Accounting available at the Assistant Professor level for Spring 2009 or Fall 2009. Competence in Financial Accounting, Cost Accounting, and/or Auditing is desired. Applicants should possess a Ph.D./D.B.A. in Accounting, or a Ph.D./D.B.A. in a related area with professional certification in accounting. Applicants must also provide evidence of teaching effectiveness and research productivity or potential. ABDs will be considered if completion is expected within the first year of appointment. The teaching load is nine credit hours per semester. Review of applications begins January 15, 2009. Towson University is AACSB-accredited in business and accounting, and jointly offers M.B.A. and M.S. in Accounting programs with the University of Baltimore. Please submit an application, *vitae*, official transcripts, and three letters of reference to: Dr. Andrew Schiff, Recruitment Chair, Towson University, Department of Accounting, Stephens Hall, Room 102, 8000 York Road, Towson, MD 21252-0001; or Email: aschiff@towson.edu.

211 MICHIGAN TECHNOLOGICAL UNIVERSITY invites applicants for a tenure-track Assistant/Associate/Full Professor in Accounting starting August 2009. This position requires a Ph.D. in Accounting from an AACSB-accredited institution. The successful candidate will be expected to develop a vigorous, nationally visible research program as well as contribute effectively to both undergraduate and graduate instruction. The School of Business & Economics (http://www.sbe.mtu.edu) is AACSB-accredited, offers competitive salaries, attractive benefits, and a reduced teaching load and summer start-up funding for junior faculty. Interested candidates should send a letter of application, resume, evidence of scholarly activity, evidence of teaching effectiveness, and three references to the School of Business & Economics at: sbe-search@mtu.edu. Michigan Tech (http://www.mtu.edu) is a nationally recognized research university and a leader in science and engineering education. Located in the scenic Upper Midwest, Michigan Tech offers a friendly, safe, and affordable living environment with excellent opportunities for year-round outdoor recreation.

212 BUTLER UNIVERSITY invites applications for a tenure-track Accounting position to start August 2009. Candidates should have teaching interests in Managerial Accounting and a willingness to teach either Not-for-Profit Accounting or Accounting Information Systems. Applicants should possess a Ph.D., be capable of high-quality teaching at the undergraduate and graduate levels, and have an active research program. Salary is competitive and is comparable to peer institutions. Accredited by AACSB, the College enrolls 700 full-time undergraduates, 275 part-time M.B.A. students, and has a Master of Professional Accounting program. The teaching load is three courses per semester but a lower teaching load is negotiable. Please send a *vita* and letter of intent to Professor Barry E. King at: king@butler.edu. Butler University is an Equal Opportunity Employer and is committed to enhancing the diversity of the student body and the faculty and staff; therefore, women and minorities are strongly encouraged to apply.

213 GEORGIA STATE UNIVERSITY, J. Mack Robinson College of Business, invites applications for Director of the School of Accountancy. Appointment is anticipated at the Full Professor level. Exceptional candidates will be considered for an endowed position. Candidates should have strong leadership skills, an earned doctorate, and a strong publication record. The Director is responsible for budgetary, personnel, and curricular decisions. Principal priorities include recruiting for a program experiencing significant growth, fund raising, and fostering external relationships. Georgia State University is located in downtown Atlanta, home to the fifth largest concentration of *Fortune* 500 companies. Salary is competitive; starting date is negotiable. Email applications to: soadir@gsu.edu. Preference will be given to applications received by 2/15/2009. For further information contact Richard Phillips at: rphillips@gsu.edu. This position is contingent upon final budget approval by the university. Georgia State University is a unit of the University System of Georgia and an Affirmative Action/Equal Opportunity Educational institution.

214 LOUISIANA TECH UNIVERSITY, School of Accountancy, seeks applications for Assistant or Associate Professor for Fall 2009 appointment. Accounting doctorate is essential, and there is a strong preference for candidates with accounting certification and an interest in financial accounting. An established publication record of discipline-based scholarship in high-quality journals is preferred. Position requires teaching at the upper division and graduate levels, publishing discipline-based research, and involvement with the accounting doctoral program. Applicant review will continue until position is filled. Salary is highly competitive. Located 65 miles east of Shreveport and 30 miles west of Monroe, enrollment is around 11,000 students. Please send applications or letters of inquiry to: Thomas J. Phillips, Jr., Director; School of Accountancy; PO Box 10318; Louisiana Tech University; Ruston, LA 71272; Phone: (318) 257-2822; Fax: (318) 257-4253; Email: phillips@latech.edu; Website: http://www.business.latech.edu. EEO/AA/ADA.

215 EASTERN MICHIGAN UNIVERSITY seeks applicants for two tenure-track Assistant and/or Associate Professor Positions to begin Fall 2009. Primary interest in Managerial or Financial Accounting, or Auditing would be preferred. A Ph.D. in Accounting from an AACSB-accredited school or its equivalent is required; an A.B.D. with substantial evidence of completion will be considered. CPA or other professional certifications, and business and teaching experience desired. Salary is competitive. EMU is a public, comprehensive university of 23,000 students in southeastern Michigan. The College of Business is AACSB-accredited. Submit letter, *curriculum vita*, and contact information for three references to: academic_hr@emich.edu, with a copy to hbunsis@emich.edu. Please reference posting # F0912 in the subject line. Send attachments only, and do not type in the body of the email. Application review starts immediately and continues until positions are filled. For more information, contact Dr. Bunsis at: hbunsis@emich.edu. Visit http://www.cob.emich.edu and/or http://www.accfin.emich.edu. EOE.

216 LOYOLA COLLEGE IN MARYLAND, Department of Accounting invites applicants for a tenure-track position at the Assistant or Associate level beginning in Fall 2009 in the Sellinger School of Business and Management (AACSB-accredited in business and accounting). Preference will be given to those who can teach in multiple areas; especially Accounting Information Systems and Advanced Accounting. The Department of Accounting seeks faculty with a strong commitment to teaching excellence and research appropriate for academically qualified status for AACSB-accreditation. For more information and to apply online, go to: http://www.loyola.edu/careers. The electronic application requires a *curriculum vita*, letter of intent, and statement of teaching and research interests. Paper applications will not be accepted. Separately, please have three letters of recommendation sent to: Chair Search Committee, Department of Accounting, SH318, Loyola College in Maryland, 4501 North Charles Street, Baltimore, MD 21210; or email: accountingdept@loyola.edu. EOE.

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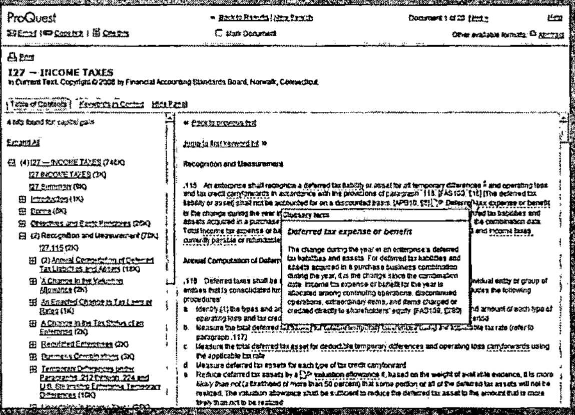

I27 — INCOME TAXES
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Deferred tax expense or benefit

The change during the year in an enterprise's deferred tax liabilities and assets. For deferred tax liabilities and assets acquired in a purchase business combination during the year, it is the change since the combination date. Income tax expense or benefit for the year is allocated among continuing operations, discontinued operations, extraordinary items, and items charged or credited directly to shareholders' equity [FAS109, ¶289]

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